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New York State Museum

173
268

JOHN M. CLARKE, Director

Museum bulletin 120

THE MINING AND QUARRY INDUSTRY

OF

NEW YORK STATE

REPORT OF OPERATIONS AND PRODUCTION DURING 1907

BY

D. H. NEWLAND

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MY DEAR SIR: I have the honor to submit herewith, for publication as a bulletin of the State Museum, the annual report on *The Mining and Quarry Industry of New York State,* prepared by David H. Newland, Assistant State Geologist.

Very respectfully
JOHN M. CLARKE
Director

State of New York
Education Department
COMMISSIONER'S ROOM

Approved for publication this 17*th day of April* 1908

A. S. Draper

Commissioner of Education.

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JUL 14 1908

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New York State Museum

JOHN M. CLARKE, Director

Museum bulletin 120

THE MINING AND QUARRY INDUSTRY
OF
NEW YORK STATE

REPORT OF OPERATIONS AND PRODUCTION DURING 1907

BY

D. H. NEWLAND

PREFACE

With the present issue the annual reviews of the mining and quarry industries of the State encompass a period of four years, the first having been published in 1905. The incentive for their continuance is found in the general interest which attaches to this branch of industrial activity, as illustrated by the number of requests received for information relating to all phases of the subject as well as by the rapid progress that is being made in the industries themselves.

The publication of the reports is rendered possible only through the cooperation of the many enterprises engaged in exploitation of the local resources; it is a pleasure to acknowledge the cordial manner with which their assistance has been given.

INTRODUCTION

Substantial progress was made during the past year in many departments of the mineral industry, and though conditions in some lines were not so prosperous as they had been in previous years, the general record may be regarded with satisfaction. The census of production that has been conducted for the present and preceding issues of this report covers over 30 different materials mined or quarried in the State; the total value of the output returned for 1907 amounted to $37,427,405, showing a small advance over the corresponding total for 1906 which was $37,132,832, the largest recorded up to that time. When compared with other years the status of the industry in 1907 appears in even more favorable light, as the value of the production in 1905 was $35,470,987 and in 1904 only $28,812,595. Within the four years for which returns have been collected, there has thus been a gain of 30 per cent in the mineral production of the State.

These valuations, it may be noted, are based on materials in elementary or first marketable form, so that they actually represent only a small part of the aggregates contributed each year by the mineral industry in general. The metallurgical and chemical products classed as mineral are among the largest items of local manufactures.

By comparison of the tables of production included herewith, it will be observed that iron mining has undergone uninterrupted expansion during the past few years. The output for 1907 amounted to 1,018,013 long tons and exceeded that of any previous year since 1890. There were 13 mines under exploitation, or two more than in 1906 when the production was 905,367 tons. Several additional mines have been under development preliminary to active work. The Clinton ore belt has been the center of special interest, and large tracts of land in Wayne and Cayuga counties have been taken over by companies with a view to mining operations. The Fair Haven Iron Co. began shipments from this region for the first time last year. The Adirondack region also has shared in the activity. The Benson mines in St Lawrence county and the Cheever mine near Port Henry have been reopened, while the deposits of titaniferous ores at Lake Sanford received attention and their operation is postponed only for the want of railroad facilities which are planned for the near future. With a return of the iron market to normal conditions, it may be expected that the iron ore production of New York will soon develop beyond all proportions of the past.

The clay materials reported in 1907 represented an aggregate value of $12,688,868. There was a decrease of $1,266,432 from the amount returned for the preceding year, due to the smaller output and market values of the building materials. The combined output of brick, tile, fireproofing and terra cotta used for building purposes was valued at $8,909,392 as compared with $11,063,433 in 1906. The number of bricks made was 1,366,842,000, of which 1,051,907,000 came from the Hudson river region. The decline in the output of building materials was counterbalanced to some degree by the gain in pottery manufactures which were valued at $2,240,895, against a value of $1,795,008 for the preceding year. Of the 61 counties of the State 43 were represented among the reports received last year from the manufacturers of clay products.

The quarries of New York contributed a value of $7,890,327, against $6,504,165 in 1906, showing an increase of about 20 per cent and establishing a new record for these industries. The total was divided according to the various uses into: building stone $2,208,545; monumental stone $162,359; curb and flagstone $1,064,193; crushed stone $2,812,998; other uses $1,642,232. The output of slate, millstones and of limestone used in making hydraulic cement is not included in the totals. The marble industry was specially active last year and the production valued at $1,571,936 has probably never been exceeded in the State. The stone quarries are distributed among all the counties practically, while they yield nearly every kind of material for building, construction or ornamental purposes.

The companies manufacturing hydraulic cement reported an output of 3,245,729 barrels, with a value of $2,971,820. The totals consisted of 2,108,450 barrels of Portland cement valued at $2,214,090 and 1,137,279 barrels of natural rock cement valued at $757,730. In the preceding year there were 4,114,939 barrels produced valued at $3,950,699, so that there was a loss for the year of 869,210 barrels in quantity and $978,879 in value. The poor showing has been due largely to the unfavorable conditions that obtained in the natural cement trade which has shown a steady decline for several years past.

The salt production of the State amounted to 9,657,543 barrels, as compared with 9,013,993 barrels in 1906, thus continuing the progress that has for some time been a feature of the industry. The value of the output was $2,449,178, exceeding that of the previous year by $317,528. There were six counties represented in the returns, with Onondaga county in the lead, though its output consisted mostly of salt used for soda manufacture. Livingston county made the largest quantity of marketable grade, chiefly rock salt.

An aggregate of 323,323 short tons of gypsum was taken from the mines and quarries of the State last year, as compared with 262,486 short tons in 1906. The output has increased by over 100 per cent within the last three years, due to the rapid development of the trade in wall plasters, stucco, etc., and to the use of gypsum in Portland cement manufacture. The value of the different materials was $1,038,355, as compared with $699,455 in 1906.

The combined value of the petroleum and natural gas produced in the State was $2,536,349, a small increase over the value reported for 1906 which was $2,487,674. The quantity of petroleum taken from the wells, estimated from the receipts of pipe line companies, was 1,052,324 barrels, valued at $1,736,335, or nearly the same as in the preceding year. The natural gas production was valued at $800,014, as compared with $766,579 in 1906; the volume amounting to 3,052,145,000 cubic feet against 3,007,086,000 cubic feet in the preceding year. New discoveries of gas continue to be reported and the additional supplies thus made available have more than sufficed to maintain the rate of production.

The mining of pyrite showed a notable advance during the past year, the output amounting to 49,978 long tons, which compares with 11,798 tons for 1906. The mineral is obtained in St Lawrence county. A large amount of exploratory and development work has been done recently, with results that may lead to a further expansion of the industry. The product finds a ready sale for making sulfurous and sulfuric acids.

The talc mines near Gouverneur contributed a production of 59,000 short tons, or a little less than in 1906. The value of the output was $501,500. The production is governed chiefly by the requirements of the paper trade and shows little tendency to fluctuate from year to year.

Garnet for abrasive uses is obtained from the eastern Adirondacks. An output of 5709 short tons valued at $174,800 was reported in 1907. The returns for the preceding year showed an output of 4729 short tons with a value of $159,298.

The crystalline graphite mined in the Adirondacks amounted to 2,950,000 pounds, against 2,811,582 pounds in 1906. The value of the product was $106,951 as compared with $96,084. Almost the whole quantity was taken from the mine at Graphite, Warren co., though many other enterprises have been inaugurated during the few years.

A somewhat unusual industry not elsewhere represented in this country is that connected with the production of natural carbon dioxid, or carbonic acid gas, as it is generally known. The gas occurs in association with the mineral waters of Saratoga Springs and its collection and storage for use form an interesting, as well as important, industrial development. About 5,000,000 pounds of the gas are sold each year, chiefly to manufacturers of carbonated waters.

Mineral production of New York in 1904

PRODUCT	UNIT OF MEASUREMENT	QUANTITY	VALUE
Portland cement	Barrels	1 377 302	$1 245 778
Natural rock cement	Barrels	1 881 630	1 207 883
Building brick	Thousands	1 293 538	7 473 122
Pottery			1 438 634
Other clay products			2 592 948
Crude clay	Short tons	8 959	17 164
Emery	Short tons	1 148	17 220
Feldspar and quartz	Long tons	8 703	28 463
Garnet	Short tons	3 045	104 325
Glass sand	Short tons	11 080	8 484
Graphite	Pounds	3 132 927	119 509
Gypsum	Short tons	151 455	424 975
Iron ore	Long tons	619 103	1 328 894
Millstones			21 476
Metallic paint	Short tons	4 740	55 768
Slate pigment	Short tons	3 132	23 876
Mineral waters	Gallons	8 000 000	1 000 000
Natural gas	1000 cubic feet	2 399 987	552 197
Petroleum	Barrels	1 036 179	1 709 770
Pyrite	Long tons	5 275	20 820
Salt	Barrels	8 724 768	2 102 748
Roofing slate	Squares	18 090	86 159
Slate manufactures			7 441
Granite			221 882
Limestone			2 104 095
Marble			478 771
Sandstone			1 896 697
Trap			468 496
Talc	Short tons	65 000	455 000
Other materials[a]			1 600 000
Total value			$28 812 595

[a] Includes apatite, carbon dioxid, diatomaceous earth, fullers earth, marl and sand. The value is partly estimated

Mineral production of New York in 1907

PRODUCT	UNIT OF MEASUREMENT	QUANTITY	VALUE
Portland cement	Barrels	2 108 450	$2 214 090
Natural rock cement	Barrels	1 137 279	757 730
Building brick	Thousands	1 366 842	7 424 294
Pottery	....	....	2 240 895
Other clay products	....	....	3 023 679
Crude clay	Short tons	3 927	6 163
Emery	Short tons	1 223	13 057
Feldspar and quartz	Long tons	8 723	36 230
Garnet	Short tons	5 709	174 800
Glass sand	Short tons	1 200	1 380
Graphite	Pounds	2 950 000	106 951
Gypsum	Short tons	323 323	1 038 355
Iron ore	Long tons	1 018 013	3 750 493
Millstones	....	....	21 806
Metallic paint	Short tons	5 269	59 521
Slate pigment	Short tons	620	3 700
Mineral waters	Gallons	8 000 000	1 000 400
Natural gas	1000 cubic feet	3 052 145	800 050
Petroleum	Barrels	1 052 324	1 736 331
Pyrite	Long tons	49 978	162 430
Salt	Barrels	9 657 543	2 449 178
Roofing slate	Squares	11 686	53 625
Slate manufactures	....	....	1 175
Sand lime brick	Thousands	16 610	109 677
Granite	....	....	195 900
Limestone	....	....	3 182 447
Marble	....	....	1 571 936
Sandstone	....	....	1 998 417
Trap	....	....	941 627
Talc	Short tons	59 000	501 500
Other materials[a]	....	....	1 850 000
Total value	....	....	$37 427 405

[a] Includes apatite, arsenical ore, carbon dioxid, diatomaceous earth, fullers earth, marl and sand and gravel exclusive of glass sand.

ARSENICAL ORE

The mining of arsenical ore is a new industry in New York
State. While arsenical minerals have been produced at different
times in the past in connection with the exploitation of
deposits, it does not appear that they were considere
or employed for the extraction of arsenic. The
prise was started in April 1906, by the or
property situated near Carmel, Kent
Shipments of crude ore and concentrates
and 1907, most of the material having
chemical works. The mine is owned by
Mining Corporation.

The ore occurrence was described briefly in the preceding issue of this report. It consists of arsenopyrite and subordinate pyrite with a quartz gangue occurring in veins that cut the gneiss country rock in proximity to a basic dike now altered to serpentine. The veins are made up of a number of parallel stringers closely set and forming what is properly called a lode. There are two such lodes of which the one worked has a northerly strike and is from 12 to 20 feet wide while the second lode intersecting at an angle of 60° has been only prospected. The ore body is opened by a vertical shaft bottomed at 100 feet from which a drift has been run along the course of the lode. It is about 12 feet wide in the drift.

During the past year the company has installed a plant for concentrating the low grade material. The process as described by Edward K. Judd,[1] consists in passing the ore through a jaw crusher and rolls and treating on hydraulic jigs of the Joplin type. There are eight jigs run by hand and provided with ¼ inch screens. The arsenopyrite is recovered from the hutch only, the material on the screens being rejected. The jig capacity is 4½ tons of crude ore or 1½ tons of concentrates each per day. The concentrates average 25 per cent arsenic.

A sample of the high grade ore gave the following percentages on analysis:

Silica	2.90
Iron	36.11
Copper	2.17
Sulfur	22.72
Arsenic	36.00
	99.90

Arsenopyrite occurs near Edenville and at other localities in Orange county, and in the town of Lewis, Essex co., 10 miles south of Keeseville. The Edenville deposit carries also leucopyrite, the diarsenid of iron and scorodite, a hydrous arsenate of iron.

CEMENT

re were few changes note in the hydraulic cement indus-
uring ive demand existed throughout
r manufacturing lines a sharp
'ast three months. Except for

with most of the states along the Atlantic seaboard New York possesses very small resources in the finer varieties of clays and kaolin. This fact has retarded the development of industries in which such materials are employed, but with the present facilities for transport the deficiency has become less formidable to local manufacturers. There are now a number of plants in the State making tableware, electrical supplies, and other porcelain and semiporcelain wares.

Production of clay materials

The tables included herewith give full details as to the production of the different clay materials in the State. They are based on returns received from practically all of the manufacturers in every department.

The value of the products reported for 1907 indicates that the year was a fairly prosperous one for the local industries though comparing somewhat unfavorably with the two preceding years when unusually flourishing conditions obtained throughout the State. There was a smaller demand for clay building materials due to decreased building operations in New York and other large cities. This brought about a severe decline in the prices which had been raised to a high level, and to a curtailment of production. The decrease in output, however, was not so marked as might have been expected owing mainly to the number of new plants that had been placed in operation during the previous year and to the enlargement of facilities in many other plants. Aside from the branches connected with the building trade, there was little change in the industry and the production of most materials was well maintained or even showed a gain.

The aggregate value of the clay manufactures of all kinds in 1907 was $12,688,868. This compared with $13,955,300, the total reported for 1906, shows a falling off of $1,266 432 or about 9 per cent for the year. Of the 61 counties in the State 43 were represented in 1907 as having an output of this class of mineral materials. The number of individual plants in operation was 242, as compared with 265 in the preceding year and 250 in 1905.

The shrinkage in the valuation of the building brick alone was greater than the combined decrease for the entire production. The total reported by the manufacturers of this material amounted to $7,424,294, against a value of $9,688,289 for 1906, or a decrease of $2,263,995. Of the total, common brick accounted for $7,201,525, as compared with $9,302,165 in 1906, and front and fancy brick for $222,769 as compared with $386,124 for the preceding year. The production of vitrified paving brick was valued at $184,306 against $178,011. Fire brick and stove lining amounted to a value of $624,033 against $527,659. The manufactures of drain tile amounted to $162,167 against $166,645; and of sewer pipe to $463,500 against $95,142. The production of terra cotta was valued at $1,224,300, as compared with $1.037,387 in 1906; fireproofing at $45,672 as compared with $120,282; and building tile at $215,126, as compared with $217,475. In addition there were produced miscellaneous materials, including flue lining, fire tile and shapes, conduit pipes, sidewalk brick and acid-proof brick, the collected value of which amounted to $104,575, against $129,402 in 1906. The potteries of the State reported an output valued at $2,240,895, as compared with a value of $1,795,008 in the preceding year.

Production of clay materials

MATERIAL	1905	1906	1907
Common brick	$9 751 753	$9 302 165	$7 201 525
Front brick	302 844	386 124	222 769
Vitrified paving brick	180 004	178 011	184 306
Fire brick and stove lining	498 184	527 659	624 033
Drain tile	146 790	166 645	162 167
Sewer pipe	444 457	95 142	463 500
Terra cotta	874 717	1 037 387	1 224 300
Fireproofing	133 995	120 282	45 672
Building tile	251 600	217 475	215 126
Miscellaneous	75 114	129 402	104 575
Pottery	1 620 558	1 795 008	2 240 895
Total	$14 280 016	$13 955 300	$12 688 868

A distribution of the production according to the counties in which it was made places Onondaga county in the lead as having the largest clay-working industry. The value of its output was $1,331,443, the greater part representing pottery. In 1906 it ranked fourth. Ulster county which was second in the preceding year maintained that position with an output valued at $1,324,476. Rockland county fell from first to third place with a total of $1,258,467. The manufacture of brick is the basis of the industry in these counties. Richmond county advanced from sixth position in 1906, to fourth last year, and contributed $1,121,524; it manufactures most of the terra cotta made in the

State. The other counties that reported a production of over $100,000 in value in 1907 were: Orange ($789,297); Erie ($786,703); Dutchess ($781,262); Monroe ($583,664); Kings ($574,863); Albany ($540,341); Columbia ($433,357); Westchester ($390,773); Ontario ($342,810); Rensselaer ($321,016); Saratoga ($256,275); Greene ($237,620); Steuben ($186,124); Suffolk ($127,610); Chautauqua ($113,350); Allegany ($111,751); and Nassau ($105,000). Queens county should also be included in the foregoing list, but the value is withheld owing to there being but a single producer.

Production of clay materials by counties

COUNTY	1905	1906	1907
Albany	$624 238	$675 099	$540 341
Allegany	118 989	111 683	111 751
Broome	18 000	12 000	8 250
Cattaraugus	*a*.........	35 500	41 234
Cayuga	25 920	17 860	14 832
Chautauqua	78 130	99 085	113 350
Chemung	96 000	90 000	88 940
Clinton	5 900	4 800	4 250
Columbia	520 500	489 750	433 357
Dutchess	1 258 937	975 410	781 262
Erie	700 527	804 159	786 703
Fulton	1 700	2 600	2 000
Greene	389 562	399 298	237 620
Jefferson	36 502	36 722	20 352
Kings	565 888	575 973	574 863
Madison	12 000	16 800	32 000
Monroe	644 411	341 870	583 664
Nassau	76 992	163 700	105 000
Niagara	3 372	10 832	16 282
Oneida	133 250	103 263	98 315
Onondaga	932 285	1 094 635	1 331 443
Ontario	345 250	343 040	342 810
Orange	1 011 006	1 170 695	789 297
Rensselaer	263 256	296 762	321 016
Richmond	645 367	896 789	1 121 524
Rockland	2 144 210	1 767 012	1 258 467
Saratoga	362 268	388 450	256 275
Schenectady	*a*.........	92 700	83 637
eneca	3 525	39 525	*a*.........
euben	164 663	209 052	186 124
uffolk	113 000	138 500	127 610
ompkins	15 004	*a*.........	7 100
ter	1 776 035	1 465 457	1 324 476
rren	45 712	34 500	25 000
shington	20 270	22 033	22 990
estchester	592 705	536 189	390 773
her countries*b*	406 542	496 886	505 960
Total	$14 280 016	$13 955 300	$12 688 868

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a Included under "other counties."

b Includes in 1906: Genesee, Herkimer, Livingston, Montgomery, New York, Queens, Lawrence, Tioga, Tompkins and Wayne counties. In 1907 the following counties are luded: Genesee, Herkimer, Livingston, Montgomery, New York, Queens, St Lawrence and Wayne.

Manufacture of building brick

The output of common building brick in 1907 amounted to 1,351,591,000, valued at $7,201,525. In addition there were made 15,251,000 front and fancy pressed brick valued at $222,769, making an aggregate output of brick for building purposes of 1,366,842,000 valued at $7,424,294. The total number manufactured in the preceding year was 1,600,059,000 valued at $9,688,289, consisting of 1,575,434,000 common brick valued at $9,302,165 and 24,635,000 front and fancy brick valued at $386,124. The manufacture of building brick was carried on in 36 counties by a total of 205 companies or individuals. In 1906 there were 37 counties represented with a total of 213 producers while in 1905 there were 39 counties and 192 producers.

The average price received for common brick was $5.33 a thousand as compared with $5.98 a thousand in 1906 and $6.53 a thousand in 1905. Front and fancy pressed brick averaged $14.61 a thousand against $15.68 a thousand in 1906 and $16.20 a thousand in 1905. The prices are based on sales at the yards.

Production of common building brick

COUNTY	1906		1907	
	Number	Value	Number	Value
Albany	74 083 000	$461 399	60 210 000	$300 141
Broome	2 000 000	12 000	1 500 000	8 250
Cayuga	2 215 000	13 310	1 804 000	10 832
Chautauqua	8 567 000	52 031	7 967 000	49 876
Chemung	15 000 000	90 000	13 289 000	8
Clinton	800 000	4 800	650 000	
Columbia	84 500 000	489 750	84 972 000	
Dutchess	167 132 000	975 410	149 130 000	
Erie	56 302 000	319 365	52 282 000	
Greene	64 690 000	390 748	35 876 000	
Jefferson	5 100 000	36 722	2 667 000	
Monroe	26 077 000	158 463	25 198 000	
Nassau	22 000 000	125 000	17 000 00	
Niagara	2 172 000	10 832	2 681 00	
Oneida	20 550 000	100 825	15 126 0	
Onondaga	22 387 000	127 494	22 460	
Ontario	3 510 000	21 700	2 600	
Orange	189 180 000	1 170 695	154 502	
Rensselaer	31 776 000	173 906	15 488	
Richmond	34 769 000	172 880	39 20	
Rockland	296 145 000	1 767 012	232 0	

COUNTY	1906		1907	
	Number	Value	Number	Value
St Lawrence	*a*	*a*	800 000	$6 000
Saratoga	70 509 000	$385 950	50 798 000	254 385
Seneca	6 050 000	36 400	*a*	*a*
Steuben	4 705 000	31 800	3 287 000	29 818
Suffolk	21 710 000	137 500	20 130 000	124 610
Tompkins	*a*	*a*	1 100 000	7 100
Ulster	252 665 000	1 465 457	260 404 000	1 322 476
Warren	*a*	*a*	5 020 000	25 000
Washington	3 300 000	18 100	2 750 000	14 300
Westchester	70 621 000	458 000	59 307 000	323 553
Other counties*b*	16 919 000	94 606	11 370 000	70 169
Total	1 575 434 000	$9 302 165	1 351 591 000	$7 201 525

a Included under "other counties."

b Includes in 1906 the following: Allegany, Cattaraugus, Fulton, Herkimer, Livingston, Montgomery, St Lawrence, Schenectady, Tioga, Tompkins and Warren. In 1907 the following counties are included: Allegany, Cattaraugus, Fulton, Herkimer, Livingston, Montgomery, Schenectady and Seneca.

Hudson river region. The counties situated along the navigable stretch of the Hudson river constitute an exceptional region as regards the clay-working industry and deserve special consideration. No other part of the State, or indeed of the country, supports so extensive a development of brick manufacture. The district supplies practically all of the common grade of brick consumed in the building operations of New York and vicinity in which market it has a decisive advantage owing to the facilities for transport by water. The yards for the most part are placed close to the river so that the brick can be shipped to destination at a minimum of expense. In the nine counties included in the region there are more than 125 yards with a combined capacity of about one and a half billions a year.

Owing to the depressed state of the trade during 1907, there was a notable reduction in the output of the region as compared with that for the two preceding years when conditions were specially prosperous. The production of common brick reported by the 122 plants that were active aggregated 1,051,907,000 valued at $5,471,713. In 1906 the production, the largest on record, amounted to 1,230,692,000 valued at $7,352,377. distributed among 131 plants. There was thus a loss for the year of 178,785,000 in quantity and of $1,880,664 in value. The highest value for any year was reported in 1905 when the output of 1,219,318,000, the second largest ever reported, made by 119 plants, was valued at $8,191,211.

The average number of brick manufactured by each plant in 1907 was 8,622,000 as compared with 9,471,000 in 1906 and 10,246,000 in 1905. The price for the whole region averaged $5.20 a thousand against $5.98 a thousand in 1906 and $6.54 a thousand in 1905, showing a drop of 20 per cent in two years.

With the exception of Columbia and Ulster, all of the counties along the Hudson river reported a reduced output, the loss being proportioned more or less to the magnitude of the industry in each county. Ulster county showed a small gain and its output of 260,404,000 valued at $1,322,476 gave it first place, ahead of Rockland county which held that position in 1906. The latter which contributed 232,018,000 valued at $1,258,467 however, had the greater number of active plants with 31 as compared with 27 for Ulster county. Orange county ranked third in the list with a production of 154,502,000 valued at $789,297 made by nine plants.

Output of common brick in the Hudson river region in 1906

COUNTY	NUMBER OF PLANTS	OUTPUT	VALUE	AVERAGE PRICE PER M
Albany	11	74 083 000	$461 399	$6 23
Columbia	6	84 500 000	489 750	5 80
Dutchess	19	167 132 000	975 410	5 82
Greene	6	64 690 000	390 748	6 04
Orange	12	189 180 000	1 170 695	6 19
Rensselaer	9	31 776 000	173 906	5 48
Rockland	33	296 145 000	1 767 012	5 97
Ulster	26	252 665 000	1 465 457	5 80
Westchester	9	70 621 000	458 000	6 46
Total	131	1 230 692 000	$7 352 377	$5 98

Output of common brick in the Hudson river region in 1907

COUNTY	NUMBER OF PLANTS	OUTPUT	VALUE	AVERAGE PRICE PER M
Albany	10	60 210 000	$300 141	$4 99
Columbia	6	84 972 000	433 357	5 10
Dutchess	19	149 130 000	781 262	5 23
Greene	5	35 876 000	184 620	5 15
Orange	9	154 502 000	789 297	5 11
Rensselaer	7	15 488 000	78 540	5 07
Rockland	31	232 018 000	1 258 467	5 42
Ulster	27	260 404 000	1 322 476	5 08
Westchester	8	59 307 000	322 553	5 46
Total	122	1 051 907 000	$5 471 713	$5 20

The past year was uneventful in respect to the New York market. The large surplus amounting to about 300,000,000 carried over by the plants from the preceding year sufficed to meet the demand in the early months before the season for brickmaking began. Consequently the prices did not reach the high level that obtained in the first part of 1906, while there were no such fluctuations as characterized the market of that year. The range was mostly between $5 and $6 a thousand at the yard, with a tendency toward the lower value for most of the time. Some shipments were marketed for less than $5. With the severe depression that took place in the fall, building operations were curtailed to an extent as to effect a practical cessation of the demand for a time, and the manufacturers were left with an unusually heavy supply of unsold brick at the close of the year. The stocks at the yards along the river are estimated at over 300,000,000. While some improvement in the market conditions is to be expected for the current season, the production will probably show little if any gain.

Other clay materials

The manufacture of paving brick was carried on during 1907 in Greene, Onondaga and Steuben counties. There were four companies engaged in the business and the output was 12,296,000 valued at $184,306. In 1906 there were five companies which reported a production of 11,472,000 valued at $178,011. Chautauqua county which was represented in the list of counties manufacturing this article in 1906 made no output last year.

Fire brick and stove lining were manufactured in Albany, Chautauqua, Erie, Kings, Rensselaer, Richmond, Schenectady, Washington and Westchester counties by a total of 12 companies. The output of fire brick amounted in value to $384,217 and of stove lining to $239,816, a combined value of $624,033. In 1906 the value of the two materials was $527,659 reported by 13 companies. Onondaga county made a small production in 1906 but none last year.

Drain tile and sewer pipe were made in Albany, Cayuga, Erie, Genesee, Madison, Monroe, Oneida, Onondaga, Ontario, Saratoga, Steuben and Washington counties. The output of drain tile was valued at $162,167 against $166,645 in 1906; and sewer pipe at $463,500 against $95,142. The large gain in the production of sewer pipe was due to the restarting of a large plant in Monroe county. There were 19 companies engaged in these industries as compared with 26 in the preceding year. The list of counties in 1906 included Chautauqua, Kings, Seneca and Wayne in addition to those already enumerated.

The output of terra cotta, fireproofing and building tile came from Albany, Allegany, Chautauqua, Genesee, Kings, Monroe, New York, Onondaga, Queens, Rensselaer, Richmond and Ulster counties, with a total of 14 companies, or three less than in 1906. The production of terra cotta was valued at $1,224,300, against $1,037,387 in 1906; fireproofing at $45,672 against $120,282; and building tile at $215,126 against $217,475. Erie and Ontario counties reported no output last year, while Ulster county was represented for the first time.

New manufacturers of clay materi

The following list includes the names of c
viduals who have erected plants during the
taken over plants from other companies, for
clay structural materials. The list is supple
published in the issue of this report for 1905

the supplementary list contained in the report for 1906 gives the names of operators and location of plants corrected to date.

NAME	LOCATION OF PLANT
Chautauqua co.	
Dunkirk Ice & Fuel Co.	Dunkirk
Dutchess co.	
N. I. Pennock	Arlington
Oneida co.	
Mohawk Valley Brick Co.	Utica
Rensselaer co.	
Lane & Co.	Castleton
Tioga co.	
Tioga Red Brick Co.	Spencer
Tompkins co.	
Cook Brick & Tile Co.	East Ithaca
Ulster co.	
Empire Brick & Supply Co.	Glasco
Lengsholz & Diedling	Malden
Henry Toppin	Ulster Landing

Pottery

The manufacture of pottery has become an important branch of the clay-working industry of the State. Its development, however, has been due rather to the exceptional facilities afforded by the State for manufacturing and marketing the products than to the existence of natural resources of crude materials that are employed in the potteries. With the exception of the deposits of slip clay in Albany county and a limited supply of stoneware clays in Onondaga county, the raw materials are derived entirely from without the State. The kaolin used comes from New Jersey and from England, the feldspar from Canada, and much of the pottery clay from New Jersey.

In the accompanying table is shown the value of the pottery manufactures during the past three years. The total valuation of the product for 1907, as returned by the individual plants, was $2,240,895. The preceding year's output was valued at $1,795,008 and that of 1905 at $1,620,558. The growth of the industry during the period has been brought about by the increased production of the high grade products — porcelain and semiporcelain tablewares and electric and sanitary supplies. The manufacture of stoneware and earthenware has remained almost stationary. The products listed in the table under " Miscellaneous " include yellow and Rockingham wares, clay tobacco pipes, fire clay crucibles and artistic pottery.

There were 22 potteries that reported as active in 1907, the same number as in the two preceding years. They were distributed among the following counties: Albany, Chautauqua, Erie, Kings, Madison, Monroe, Nassau, Onondaga, Ontario, Schenectady, Suffolk, Washington and Wayne. Onondaga holds first place in point of production, with a total for 1907 valued at $1,095,958, as compared with $858,270 in 1906 and $718,985 in 1905. Kings county is the second largest producer, contributing an output valued at $343,121, against $306,105 in the preceding year and $308,443 in 1905.

Value of production of pottery

WARE	1905	1906	1907
Stoneware	$115 890	$84 031	$65 271
Red earthenware	30 740	30 234	28 296
aPorcelain and semiporcelain	800 000	835 000	1 181 162
Electric and sanitary supplies	600 325	768 236	869 378
Miscellaneous	73 603	77 507	96 788
Total	$1 620 558	$1 795 008	$2 240 895

a Includes china tableware.

Crude clay

In the foregoing tables relating to clay products no account has been taken of the crude clay entering into their manufacture. There are a few producers in the State who do not utilize the crude clay themselves, but ship their output to others for manufacture. Some of the material, like the Albany slip clay for example, is even forwarded to points without the State. In 1907 returns were received from four producers in this branch of the industry whose total shipments amounted to 3927 short tons valued at $6163. The corresponding total for 1906 was 5477 short tons valued at $9125 and for 1905 it was 6766 short tons with a value of $16,616.

DIATOMACEOUS EARTH

The production of diatomaceous or infusorial earth is
to a small extent in New York State. The deposits

bottoms of the small Adirondack lakes, those in Herkimer county being best known, and are formed by the accumulation of the minute silicious skeletons of organisms inhabiting the waters. They attain a thickness up to 30 feet in White Lead lake from which the present supply is obtained. The material is excavated and purified by washing and settling in vats, after which it is compressed into cakes for shipment. According to an analysis published in the report for 1905 it contains about 86 per cent silica, 2 per cent or less of iron oxid, alumina and lime, and about 12 per cent water.

The earth is employed as an abrasive, particularly for polishing of metal surfaces, as a substitute for quartz in the manufacture of wood filler, and for various other purposes. The production reported in 1907 was made by George W. Searles of Herkimer.

EMERY

The source of the small quantity of emery produced in the State is near Peekskill, Westchester co. The material in crude state is a rock, made up of corundum, spinel and magnetite chiefly, and represents a phase of the basic igneous intrusions of that vicinity which are known as the Cortlandt series. The emery occurs as lenses and bands grading off at the edges into the country rock which is usually norite. The material was originally worked as an iron ore, but unsuccessfully owing to its refractory nature from the presence of so much alumina. In their geological relations the bodies resemble the titaniferous magnetites of the Adirondacks, a similarity that is strengthened by the fact that the analyses of the emery show a small percentage of titanium.

The production of emery in 1907 amounted to 1223 short tons, valued at $13,057. This is a little less than the production for the preceding year which totaled 1307 short tons valued at $13,870. In 1905 the output was 1475 short tons valued at $12,452 and in 1904, 1148 tons valued at $17,220. The valuation is based on the material at the quarries, where it undergoes only hand sorting and cobbing preparatory to shipment to outside points for grinding and manufacture into emery wheels, stones, cloth, etc.

The list of producers in 1907 includes the following: Blue Corundum Mining Co., Easton, Pa., Keystone Emery Mills, Frankford, Pa., Tanite Co., Stroudsburg, Pa., J. R. Lancaster, Peekskill, and J. H. Bugby, Peekskill. With the exception of J. R. Lancaster and J. H. Bugby, the companies mine the emery for their own use in connection with manufacturing plants.

FELDSPAR

The output of this mineral is won from occurrences of pegmatite that are found in the Adirondacks and in the southeastern section of the State. The quarries near Bedford, Westchester co., have supplied in recent years most of the feldspar suitable for pottery uses, while the Adirondack quarries have furnished material for roofing purposes, poultry grit and to a limited extent for pottery. Quartz is always associated with the feldspar and it is sometimes utilized as well.

The combined production of feldspar and quartz in 1907 amounted to 8723 long tons valued at $36,230. The total compares with 13,660 long tons valued at $44,350 in the preceding year. The value of the feldspar sold to pottery makers ranges from about $3 per ton for the crude to $7 per ton for the ground product, at the quarries or mills. The quantity sold for other purposes has not been included in the totals.

The quarries near Bedford, owned by P. H. Kinkel's Sons, have been the most important producers of pottery feldspar. A part of their output is ground before shipment. The quartz is sold to the Bridgeport Wood Finishing Co. for manufacture into wood filler. The Hobby quarry, in the town of Northcastle, opened by Otto Buresch, was also worked in 1907 by P. H. Kinkel's Sons. The feldspar occurs here in very large massive crystals, with little tendency toward the usual intergrowth with quartz, a feature of considerable importance in quarry work.

In the Adirondack region, the Claspka Mining Co. and the International Mineral Co. have been active during the past year. The quarry owned by the former company is situated near Batchellerville, Saratoga co., and the output is shipped to potteries. The International Mineral Co. has a quarry and mill near Rock pond, Essex co., west of Ticonderoga. The pegmatite is crushed and shipped unsorted for roofing material, for which purpose it takes the place of common gravel, but is considered superior to the latter owing to the fact that the feldspar with its smooth cleavage planes has greater adhesive properties when applied to tarred surfaces. The smaller sizes made in crushing the pegmatite are sold for poultry grit.

A new enterprise that began production in the early part of tl present year is the Crown Point Spar Co., with a quarry n Crown Point, Essex co. The pegmatite occurs in the midst gneissoid granite and apparently is a coarse phase of the gr magma crystallized in place, since it shows little resemblance in form to a dike cutting the gneiss intrusively or to a vein occupying a fissure. It constitutes a mass that is traceable for several hundred feet along the strike and across the dip of the gneiss, and is as yet only partially explored. The quarry is situated near the eastern face of the ridge known as Breed's hill, 1½ miles south of Crown Point and ⅓ mile west of the Delaware & Hudson Railroad. A large mill has been erected close to the railroad, where the rock is conveyed by a cableway. The mill equipment is very complete and will enable the company to supply feldspar in any of the forms in which it is marketed. The pegmatite is an intergrowth of potash feldspar and quartz with a little mica and tourmalin. The separation of the minerals is effected entirely by mechanical means after crushing, whereas in other quarries the removal of the quartz and iron-bearing impurities is performed by hand cobbing. The feldspar belongs to the variety known as microcline, which has the same chemical composition as orthoclase, but differs in its crystallization.

GARNET

The abrasive garnet industry in the Adirondacks continued to progress during 1907, as shown by the output which exceeded all previous records, having been about 20 per cent larger than that for the preceding year. There were no new discoveries, and mining has been restricted to the usual localities.

The North River Garnet Co., owning property at Thirteenth lake, Warren co., is the largest operator in the region. The company has an unlimited supply of garnet rock which is obtained by open quarry work. The rock face now exposed measures 142 feet in hight, while there is known to be an extensive body below the level of the present workings. The material is crushed and concentrated mechanically by a process specially planned for the purpose by Mr F. C. Hooper. By the addition of another unit to the mill, the productive capacity has been raised to about 8000 or 9000 tons annually, which is considerably in excess of the present market requirements of the country.

The Gore mountain and Garnet peak properties near North River are worked during the open season, the former by H. H. Barton & Sons Co., and the latter by the American Glue Co. The garnet occurs in both places as large crystal masses in a hornblende gneiss. It is separated by hand cobbing.

On the slopes of Mt Bigelow in northern Essex co., about

5 miles south of Keeseville, there is a large body of nearly pure garnet that has been described in the issue of this report for 1905. In regard to geological features, the garnet shows a good deal of contrast to the other occurrences. Much of the material has a massive appearance, consisting of granular particles loosely bound together, though in places a tendency toward crystal structure may be observed. Exploratory operations have been conducted during the last two years by G. W. Smith of Keeseville, and a considerable quantity of the garnet was shipped in 1907 to American and foreign consumers.

The Adirondack localities furnished a total of 5709 short tons in 1907, valued at $174,800, as compared with 4729 short tons ($159,298) in the preceding year. The output during the first six months of the year was proportionately larger than in the latter half when the market fell off in sympathy with the general business depression.

GRAPHITE

The production of crystalline graphite during the past year has been attended by few developments of special interest. As heretofore, the American mine near Hague, Warren co., supplied most of the output. This mine, owned by the Joseph Dixon Crucible Co., has been operated steadily for many years and may be said to represent the only firmly established enterprise in the Adirondacks. Stimulated by its success, several other mines have been opened in the surrounding region, but in most cases without commensurate results.

The total reported by the companies in 1907 was 2,950,000 pounds, having a valuation of $106,951. The production in the preceding year was 2,811,582 pounds valued at $96,084, while in 1905 it was 3,897,616 pounds valued at $142,948. The average value of the graphite per pound was 3.6 cents in 1907, 3.4 cents in 1906 and 3.7 cents in 1905. There has thus been a shrinkage in the prices, as well as in the production since 1905, though a slight gain in both is shown for the last year over the corresponding figures for 1906.

The Crown Point Graphite Co. discontinued operations at the mine near Penfield pond, Essex co. A deposit near Eagle lake will be worked during the coming season, in preparation for which the present plant has been enlarged.

The Glens Falls Graphite Co. has erected a mill at the mine situated near Conklingville, 8 miles west of Hadley, Saratoga co. Only experimental runs have been made thus far. The deposit is reported to be extensive. It belongs to the sedimentary type, the graphite being distributed along the bedding or cleavage planes of a quartzite.

The Empire Graphite Co. has a property near Greenfield, Saratoga co., and began active work in the early part of 1908.

In St Lawrence county some attention has been given to a deposit occurring on the Indian river about 3 miles from Rossie village. The graphite forms the principal constituent of a schist, through the body of which it is distributed richly in very small scaly particles. It is a crystalline graphite, but too fine in size to be easily separated. Trial shipments of the crude material were reported to have given satisfactory results when used for foundry purposes.

The wide distribution of graphite in the Adirondack region undoubtedly makes it a promising field for prospecting and mining, but there are strict limitations surrounding the industry, the neglect of which on the part of the mining companies has led to many failures. The amount of capital expended in the erection of new milling plants and mine equipment during the last five years aggregates several hundred thousand dollars, and in many cases there has been little or no return for the outlay.

The separation and refining of graphite under the conditions presented by the Adirondack occurrences involve unusual difficulties. As described in previous reports, the deposits that have been the main sources of supply consist of disseminated flakes in a gangue that ranges from quartzite to a feldspar-quartz schist with a considerable percentage of dark silicates. While the graphite has a specific gravity somewhat below that of the accompanying minerals, the difference is not sufficient to make a separation by gravity methods alone practicable, and in fact is of less importance than the scaly habit of the mineral. The first separation is carried out by shaking tables, buddles or by the pneumatic jig, and the product secured, corresponding to the tailings in the concentration of metallic ores, contains a certain amount of slimes or dust and any other scaly minerals, as well as the graphite. The elimination of the granular impurities can be effected satisfactorily, if the graphite is relatively coarse, by the pneumatic or flotation methods of refining, but scaly silicates like mica are not readily removed.

Biotite and phlogopite are the varieties of mica commonly found in the graphite rock. Owing to their scaly habit and disseminated distribution they are somewhat difficult to distinguish from the graphite flakes in hand specimen, though under the microscope they are readily revealed by their transparency. A considerable percentage of mica will be discovered oftentimes in this way when microscopic examination fails to reveal its presence.

The size of the graphite flakes is another feature that must be taken into consideration. A rock carrying a coarse crystal, other things being equal, is the more desirable, since the economy and perfection of the separation process increase in direct relation to the size of the graphite. The coarse sizes also command higher prices in the market than the fine flake, under equal conditions of purity.

There is considerable variation in the crystallization of the graphite depending upon the character of the gangue. The schists and quartzites of the Adirondacks represent ancient sediments of the nature of sandstones and sandy shales which have been transformed under the influences of heat and pressure while they were deeply buried in the earth. The graphite is traceable to the carbonaceous constituents of plants or animals included in the sediments at the time of their deposition, and its formation which involves a distillation of the organic compounds with loss of the volatile parts was an accompaniment of the general metamorphism. It is to be expected that the graphite would show a more perfect crystal development in rocks that have been profoundly changed, and this is, in fact, the case. The schists of the eastern and interior parts of the Adirondacks carry a much coarser flake than the rocks on the western side which have been less metamorphosed. In the deposits of St Lawrence county, on the west, the flake is very fine, at times showing an approach to amorphous graphite. This is, of course, only true with respect to the deposits of organic nature in the sedimentary rocks. The graphite found in veins and dikes is quite uniform throughout the whole region, but such occurrences have little importance from an industrial standpoint.

GYPSUM

The production of gypsum is made in the central and western parts of the State, in Madison, Onondaga, Cayuga, Monroe, Genesee and Erie counties. The gypsum is associated with the Salina formation which carries the rock salt beds and is quarried or mined along the outcrop from Madison county westward. The Salina formation can be traced to the east into Albany county but with such diminishing thickness as to preclude the occurrence of workable gypsum deposits in that section.

Most of the workings are situated near the southern edge of the belt occupied by the Salina beds. The gypsum occurs below the Bertie waterlime which marks the top of the formation and above the salt horizon. Its beds are regularly disposed with respect to the inclosing rocks, dipping with them at a very low angle to the south. They afford a practically inexhaustible supply. Their greatest thickness along the outcrop is in Onondaga county where as much as 60 feet have been found, divided into several layers. In the western part of the State the beds range from 4 to 8 feet thick. Many of the borings for salt have encountered gypsum, showing its continuation for long distances to the south along the dip of the strata.

The present extensive utilization of gypsum in New York has been due to the establishment of plants for the manufacture of plaster of paris, stucco, wall plasters, etc., a branch of the industry that has grown to large proportions in the last decade. Formerly the principal outlet for the mineral was in agriculture which still affords a small market for the ground product. Another use that has become quite important is in the Portland cement trade; a considerable proportion of the gypsum listed in the accompanying table as sold in crude state is shipped to points in Pennsylvania and elsewhere for admixture with Portland cement.

The gypsum rock as found in New York has a gray or drab color. It contains a varying amount of impurities in the form of lime and magnesia carbonates, clay and silica or quartz, besides a small proportion of organic matter which is the principal coloring agent. In calcination the organic substances are broken up or driven off. The impurities on the average amount to from 5 to 15 per cent of the total.

The manufacture of calcined plasters is carried on in Syracuse and vicinity, at Wheatland and Garbutt, Monroe co., and at Oakfield, Genesee co.

Production and trade. With the exception of the last three months of the year, the demand for gypsum and gypsum materials was active, stimulating a largely increased output. The quantity of gypsum mined or quarried during the year was

323,323 short tons, as compared with 262,486 short tons in 1906; 191,860 short tons in 1905 and 151,445 short tons in 1904. The output has thus more than doubled within the last three years. It is to be expected from the present general conditions of business that there will be little if any advance made during the current year.

Of the total quantity of crude rock reported for 1907, about 70 per cent was calcined for plaster. The product of plaster of paris, wall plasters, etc., amounted to 222,502 short tons valued at $820,064, which compares with 163,451 short tons valued at $595,285 in the preceding year. The totals include only the quantities made from gypsum obtained in the State; some crude gypsum is imported each year from Canada and calcined in local plants. The amount of ground gypsum or land plaster made was 15,441 short tons valued at $38,859, against 20,656 short tons valued at $46,094 in 1906. The portion sold in crude state to Portland cement manufacturers and for other purposes amounted to 91,060 short tons valued at $179,432, against 34,626 short tons valued at $58,076 in the preceding year.

Production of gypsum

	1906		1907	
	Short tons	Value	Short tons	Value
Total output, crude........	262 486	....	323 323	....
Sold crude.................	34 626	$58 076	91 060	$179 432
Ground for land plaster....	20 656	46 094	15 441	38 859
Wall plaster etc. made.....	163 451	595 285	222 502	820 064
Total value...........	....	$699 455	....	$1 038 355

The Akron Gypsum Co. and the American Gypsum Co. made a production for the first time in 1907. Their properties are located near Akron, Erie co., where an excellent quality of rock is found, running as high as 95 per cent gypsum. The former company has a mill and warehouse under construction and will ship its output in manufactured form. The American Gypsum Co. sold the crude rock.

The Victor Gypsum Co. was engaged in the exploration of a property at Victor, Ontario co., but has made as yet no production.

The United States Gypsum Co. has taken over the quarry and mill of the Cayuga Plaster Co., at Union Springs, which has been operated in addition to its properties at Oakfield.

A new quarry has been opened at Jamesville, Onondaga co., by James E. Hubbell of Syracuse. The beds are reported to be 60 feet thick. Analyses furnished by Mr Hubbell show the following percentages:

	1	2
SiO_2	3.34	5.56
Fe_2O_3, Al_2O_3	2.92	1.88
$CaCO_3$	3.32	4.10
$MgCO_3$	2.69	3.32
$CaSO_42H_2O$ (Gypsum)	87.48	85.18
	99.75	100.04

No. 1 is a sample of soft weathered rock and No. 2 of the hard rock.

IRON ORES

The activity in the mining of iron ores during recent years was well maintained throughout most of 1907, as it was only in the last two or three months of the year that the production began to fall off in sympathy with the general business depression. The returns furnished by the mining companies show an advance sufficient to carry the production to a point above that recorded for any year since 1890, the total amounting to over 1,000,000 tons. With the increment supplied by the new enterprises, there would have been, undoubtedly, a still larger gain recorded for the present year if the market had continued favorable, but several mines have now suspended work and will await improved conditions before resuming.

There were 13 companies engaged in mining during the year, besides those carrying on exploratory or other preparatory work. This shows a gain of two over the number for the preceding year.

The accompanying table gives the production of iron ore, distributed according to kinds, for the period 1890–1907 inclusive. The statistics covering the years previous to 1904 are taken from the annual volumes of the *Mineral Resources* published by the

United States Geological Survey, while the figures from 1904 to date have been collected at this office. They represent marketable ores as shipped to the furnace and not the mine output which is considerably larger, since the greater portion of the magnetite ores is concentrated.

Production of iron ore in New York State

YEAR	MAGNETITE	HEMATITE	LIMONITE	CARBONATE	TOTAL	Total value	Value per ton
	Long tons	Long tons	Long tons	Long tons	Long tons		
1890	945 071	196 035	30 968	81 319	1 253 393	....	.....
1891	782 729	153 723	53 152	27 612	1 017 216	....	.....
1892	648 564	124 800	53 694	64 041	891 099	$2 379 207	$2 67
1893	440 693	15 890	35 592	41 947	534 122	1 222 934	2 29
1894	....	....	....	....	242 759	....	.....
1895	260 139	6 769	26 462	13 886	307 256	598 313	1 95
1896	346 015	10 789	12 288	16 385	385 477	780 932	2 03
1897	296 722	7 664	20 059	11 280	335 725	642 838	1 91
1898	155 551	6 400	14 000	4 000	179 951	350 999	1 95
1899	344 159	45 503	31 975	22 153	443 790	1 241 985	2 80
1900	345 714	44 467	44 891	6 413	441 485	1 103 817	2 50
1901	329 467	66 389	23 362	1 000	420 218	1 006 231	2 39
1902	451 570	91 075	12 676	Nil	555 321	1 362 987	2 45
1903	451 481	83 820	5 159	Nil	540 460	1 209 899	2 24
1904	559 575	54 128	5 000	Nil	619 103	1 328 894	2 15
1905	739 736	79 313	8 000	Nil	827 049	2 576 123	3 11
1906	717 365	187 002	1 000	Nil	905 367	3 393 609	3 75
1907	853 579	164 434	Nil	Nil	1 018 013	3 750 493	3 68

The total shipments reported by the mines in 1907 amounted to 1,018,013 long tons, valued at $3,750,493. As compared with the preceding year when the shipments were 905,367 tons valued at $3,393,609, there was an increase in output of 112,646 tons or about 12 per cent.

Classified as to variety the shipments consisted of 853,579 tons of magnetite and 164,434 tons of hematite. Of the magnetite 499,895 tons were marketed in the form of concentrates with an approximate content of 65 per cent iron. The 353,684 tons of lump magnetite included in the total are es[illegible]d to average 60 per cent iron. The hematite and limoni[illegible] to 60 per cent, with an average probably of 45 [illegible]

The 499,895 tons of magnetite con[illegible] approximately 818,467 tons of crud[illegible] or amount of ore hoisted during 190[illegible]ons which compares with 1,154,814 long[illegible]85 long tons in 1905. Based on the cru[illegible] was probably as large as that record[illegible] New York State.

Of the magnetite 801,820 tons were derived from the Adirondacks. The producers in that region included Witherbee, Sherman & Co., and the Port Henry Iron Ore Co., at Mineville; the Chateaugay Ore & Iron Co., at Lyon Mountain; and the Benson Mines Co., at Benson Mines. The Arnold Mining Co. at Arnold was inactive. In southeastern New York, the Hudson Iron Co., operating the Forest of Dean mine and the Sterling Iron & Railway Co., operating the Lake mine were the only ones to report a production.

Of the output of hematite 55,409 tons were reported by the Rossie Iron Ore Co., and the Old Sterling Iron Co., who own mines near Antwerp, St Lawrence co., and 109,025 tons by the producers of oolitic and fossil hematite from the Clinton formation. The latter producers were as follows: Franklin Iron Manufacturing Co., and C. A. Borst, Clinton; Fair Haven Iron Co., Sterling; Furnaceville Iron Ore Co., and Ontario Iron Ore Co., Ontario Center. The Fair Haven Iron Ore Co. and the Ontario Iron Ore Co. made their first shipments in 1907.

Several new developments have been under way during the year. In the Adirondacks, the Cheever mine near Port Henry which has been closed down for the last 15 years, was reopened and equipped with a mill of 300 tons daily capacity. The company expected to begin shipments the present season. The exploration of the titaniferous magnetite deposits at Lake Sanford in the central part of the Adirondacks, mentioned in the preceding issue of this report was prosecuted with energy and surveys have been nearly completed for a railroad to afford access to the locality from Lake Champlain, some 40 miles distant. The results of test borings on the property have been favorable in respect to the continuation of the deposits in depth.

In Wayne county, on the western section of the Clinton deposits, there has been unusual activity and large tracts of land situated along the outcrop of the ore have been taken over by mining companies. The Furnaceville Iron Co. is the pioneer among the latter, while the Wayne Iron Ore Co., the Lake Ontario Iron Ore Co., and the Rochester Iron Ore Co. were organized in 1907. A large amount of exploration has been performed in Wayne and Cayuga counties, and with the restoration of former market conditions, it may be expected that extensive mining operations will be instituted.

Mineville. The output of ore from this locality in 1907 was probably the largest [illegible] excess of that reported for any recent year. [illegible] tons was hoisted from the mines of [illegible] & Co. and the Port Henry Iron Ore Co. The [illegible] mine group which includes the "21" [illegible] workings furnished the greater part of the output, [illegible] shafts of Witherbee, Sherman & [illegible] share The expansion of mining has [illegible] the addition of the power facilities from the [illegible] the lake side at Port Henry. This plant [illegible] was placed in operation during the past year.

The Port Henry Iron Ore Co. has been engaged in sinking its new shaft on the "21" property east of the Bonanza shaft. It will have a vertical depth of [illegible] feet, with crosscuts at intervals of 80 feet extending into the ore body. It is divided into three compartments of which two are for hoisting and will have a capacity of 1500 tons a day. This will more than double the former output of the mine, bringing the total hoisting capacity of the two companies up to fully 1,000,000 tons annually.

Mining is to be resumed on the Barton hill group which has lain idle for several years. The group comprises a number of openings made at intervals along a practically continuous bed that lies to the west of the Old Bed mines and extends 3500 feet in a northerly direction over the shoulder of Barton hill. An adit starting from the Arch pit near the middle of the bed is under construction and will give an outlet to the surface for the ore in the northern section where recent exploration has disclosed the existence of bodies hitherto unworked.

Benson mines. This property belonging to the Magnetic Iron Ore Co. has been taken over by the Benson Mines Co. and was again placed in operation in the fall of 1907 after making improvements in the mining and milling equipment. Altogether about $150,000 was expended in bringing the installation up to date.

The deposits are lo[illegible] aging [illegible] but they rank am[illegible] the Adi[illegible] general characte[illegible] t L[illegible] consist of [illegible] s car[illegible] dissemінate[illegible] distr[illegible] mass of the [illegible] et i[illegible] workings, [illegible] attraction [illegible] probable that the Ulster county grit might be well adapted for the lining of pebble mills, an application which has not been attempted, hitherto, so far as known. Such mills are employed quite extensively for fine grinding of feldspar and other hard materials. They are usually lined with imported French rock which is furnished in small blocks dressed to the required shape. In its general freedom from iron or other coloring agents, the grit fulfils one of the important requisites for such material, but its wearing qualities under the severe conditions can not be determined except by actual test.

The production of millstones in 1907 amounted to a value of $21,806, as compared with $22,442 in 1906 and $22,944 in 1905. The production includes also the blocks and disks quarried and sold for roll crushers. At one time the output of Ulster county was valued at over $100,000 annually.

MINERAL PAINT

The term mineral paint is here used to designate the natural mineral colors obtained by grinding an ore or rock. The materials suitable for this purpose that are found in New York State include iron ore, shale, slate and ocher.

For metallic paint and mortar colors some form of iron ore, generally hematite or limonite, is commonly employed, but only a few localities are known where the ore possesses the requisite qualities of color and durability. The fossil hematite from the Clinton formation is perhaps most widely used in this country. The mines owned by C. A. Borst at Clinton, Oneida co., and those of the Furnaceville Iron Co. at Ontario, Wayne co., supply much of the crude material. The red hematite mined by the Rossie Iron Ore Co. at Rossie, St Lawrence co., also yields a good metallic paint.

Mineral paint made from shale and slate is quite extensively used for wooden structures. When there is a considerable percentage of iron oxids present, the shale and slate may be sold for metallic paint. Their value depends largely upon the depth and durability of their color; but the degree of natural fineness and the amount of oil required in mixing must also be considered in determining their utility. At Randolph, Cattaraugus co., beds of green, brown and bluish shale occur in the Chemung formation. They are worked by the Elko Paint Co. In years past red shale has been obtained in Herkimer county from the Vernon beds at the base of the Salina. A similar material occurring in the Catskill series has been worked at Roxbury, Delaware co. The red slate of Washington county, which belongs in the Cambric, is also ground for paint. The Algonquin Red Slate Co. of Worcester, Mass., and A. J. Hurd of Eagle Bridge produce this material.

A product known as mineral black is made by grinding slate found in the Hudson River series.

The ferruginous clay called ocher occurs quite commonly in the State, but no deposits are exploited at present. A bed occurring on Crane mountain, Washington co., once supplied a considerable quantity.

Sienna, a variety of ocher, occurs near Whitehall. The deposit is a thin stratum in glacial drift and has been worked on a small scale.

In addition to the producers above mentioned, the Clinton Metallic Paint Co., of Clinton, and the William Connors Paint Manufacturing Co., of Troy, are engaged in the manufacture of mineral paints from New York materials.

The production of mineral paints in 1907 was as follows: metallic paint and mortar color, 5269 short tons valued at $59,521; slate pigment, 620 short tons valued at $3700. In the year 1906 the following quantities were reported: metallic paint and mortar color, 2714 short tons valued at $29,140; slate pigment, 2045 short tons valued at $15,960. These quantities include only the output made within the State from local materials. A part of the ore and rock is shipped each year to points outside of the State for manufacture. An output of 9667 long tons valued at $24,185 was reported in 1907 by four firms who sell the crude ore or rock to paint grinders. In the preceding year the corresponding total was 9382 tons valued at $22,949.

MINERAL SPRINGS

The mineral springs of New York afford a variety of waters suited for medicinal and table uses. There are over 200 springs in the State that have been listed and classified according to the nature of their dissolved mineral ingredients, though many have no commercial application, except perhaps for local consumption. Some of the spring localities — like Saratoga Springs, Ballstor Springs and Richfield Springs — are popular resorts during tl summer season and in this way the waters afford an indirect t very important source of income.

Among the spring waters that contain mineral ingredients in appreciable quantity, those characterized by the presence of alkalis and alkaline earths are the most abundant in this State. The dissolved bases may exist in association with chlorin and carbon dioxid, as is the case with the springs of Saratoga county, or they may be associated chiefly with sulfuric acid as illustrated by the Sharon and Clifton Springs.

The mineral waters of Saratoga Springs and Ballston are found along fractured zones in Lower Siluric strata, the reservoirs occuring usually in the Trenton limestone. They are accompanied by free carbon dioxid, which together with chlorin, sodium, potassium, calcium and magnesium exists also in dissolved condition. The amount of solid constituents in the different waters varies from less than 100 to over 500 grains per gallon. Large quantities of table and medicinal waters are bottled at the springs for shipment to all parts of the country. The carbon dioxid which issues from the wells at Saratoga is likewise an important article of commerce.

The waters at Richfield Springs contain the elements of the alkali and alkaline earth groups together with sulfuric acid and smaller amounts of chlorin, carbon dioxid and sulfureted hydrogen. They are employed for medicinal baths as well as for drinking purposes. The springs issue along the contact of Siluric limestone and Devonic shales. Sharon Springs is situated to the east of Richfield Springs and near the contact of the Lower and Upper Siluric. Clifton Springs, Ontario co., and Massena Springs, St Lawrence co., are among the localities where sulfureted waters occur and are utilized.

The Oak Orchard springs in the town of Byron, Genesee co., are noteworthy for their acid waters which contain a considerable proportion of aluminum, iron calcium and magnesium, besides free sulfuric acid.

The Lebanon spring, Columbia co., is the single representative in the State of the class of thermal springs. It has a temperature of 75° F. and is slightly charged with carbon dioxid and nitrogen.

A branch of the industry that has recently assumed considerable importance in New York State is the sale of spring waters which can not be classed as mineral in the usual sense of the term, but find wide use as potable waters on account of their freedom from harmful impureties. Such waters are usually shipped in bulk to the principal cities where they are bottled and distributed by wagons among the individual consumers. The Great Bear spring at Fulton and the Deep Rock spring at Oswego are examples of this class of springs.

The following list includes the names of the leading springs in the State which are employed for commercial purposes or have recently been so employed:

NAME	LOCALITY
Baldwin Mineral Spring	Cayuga, Cayuga co.
Chautauqua Lithia Spring	Westfield, Chautauqua co.
Breesport Oxygenated Mineral Spring	Breesport, Chemung co.
Chemung Spring	Chemung, Chemung co.
Magnetic Flint Rock Spring	Elmira, Chemung co.
Rockdale Mineral Spring	Rockdale, Chenango co.
Lebanon Mineral Spring	Lebanon Springs, Columbia co.
Mount View Spring	Poughkeepsie, Dutchess co.
Ayers Amherst Mineral Spring	Williamsville, Erie co.
Avon Sulphur Springs	Avon, Livingston co.
Artesian Natural Mineral Spring	Franklin Springs, Oneida co.
Glacier Spring	Franklin Springs, Oneida co.
Kirkland Spring	Franklin Springs, Oneida co.
Split Rock Spring	Franklin Springs, Oneida co.
Geneva Lithia Mineral Water Spring	Geneva, Ontario co.
Crystal Springs	Oswego, Oswego co.
Deep Rock Spring	Oswego, Oswego co.
Great Bear Spring	Fulton, Oswego co.
White Sulphur Springs	Ritchfield Springs, Otsego co.
Massena Spring	Massena Springs, St Lawrence co.
Artesian Lithia Spring	Ballston Spa, Saratoga co.
Arondack Spring	Saratoga Springs, Saratoga co.
Champion Spring	Saratoga Springs, Saratoga co.
Chief Spring	Saratoga Springs, Saratoga co.
Congress Spring	Saratoga Springs, Saratoga co.
Empire Spring	Saratoga Springs, Saratoga co.
Eureka White Sulphur and Mineral Spring	Saratoga Springs, Saratoga co.
Geyser Spring	Saratoga Springs, Saratoga co.
Hathorn Spring	Saratoga Springs, Saratoga co.
Hides Franklin Spring	Saratoga Springs, Saratoga co.
High Rock Spring	Saratoga Springs, Saratoga co.
Lincoln Spring	Saratoga Springs, Saratoga co.
Patterson Mineral Spring	Saratoga Springs, Saratoga co.
Royal Vichy Spring	Saratoga Springs, Saratoga co.
Saratoga Carlsbad Spring	Saratoga Springs, Saratoga co.
Saratoga Seltzer Spring	Saratoga Springs, Saratoga co.
Saratoga Victoria Spring	Saratoga Springs, Saratoga co.
Star Spring	Saratoga Springs, Saratoga co.
Washington Lithia Spring	Ballston Spa, Saratoga co.
Chalybeate Spring	Sharon Springs, Schoharie co.
Magnesia Spring	Sharon Springs, Schoharie co.
White Sulphur Spring	Sharon Springs, Schoharie co.
Red Jacket Mineral Spring	Seneca Falls, Seneca co.
Pleasant Valley Mineral Spring	Rheims, Steuben co.
Sulphur Spring	Hornby, Steuben co.
Setauket Spring	East Setauket, Suffolk co.
Big Indian Spring	Ellenville, Ulster co.
Elixir Spring	Clintondale, Ulster co.
Vita Spring	Fort Edward, Washington co.
Clyde Mineral Spring	Clyde, Wayne co.

The industry in connection with the production and sale of spring waters has attained to large proportions and promises to show continued growth. The quantity marketed at present may be estimated at fully 8,000,000 gallons a year with a value of about $1,000,000. Approximately one half of the total value is represented by sales of mineral waters from Saratoga co. The figures given are estimates based on a partial canvass of the industry. A more accurate statement of the production is impracticable owing to the many changes that take place in the industry each year. The commercial utilization of many springs is transitory and others are employed only locally for supplying hotels, sanatoriums, etc. It is believed, however, that the estimate is close to the actual production.

NATURAL GAS

The production of natural gas for lighting and heating purposes has been carried on in New York since the first part of the preceding century. It is recorded that the village of Fredonia, Chautauqua co., was illuminated by gas supplied from local wells as early as 1825, an event attracting widespread interest at the time and no doubt a precursor of the extensive exploitation of the natural gas fields in other sections of the country. Following this development came the discoveries of the pools in Cattaraugus county which began about 1865, and later those in Allegany county, a result of explorations conducted for petroleum. Within the last 20 years there has been a great expansion in the industry and gas wells are now scattered over most of the western part of the State, including 15 counties which are active producers.

Geological occurrence. The range of the productive gas pools geologically may be said to extend from the base of the Paleozoic sedimentary formations, the Potsdam sandstone, to the Chemung and Portage formations of the Devonic which are near the top of the Paleozoic series as represented in New York. Certain formations, however, are more prolific than others, and the wells in each field, as a rule, derive their main supply from a definite horizon.

Though small amounts of gas have been found in sandstones correlated with the Potsdam, the lowest beds which are the source of any considerable flow are the limestones of Trenton age. The wells of Oswego and Onondaga counties now supplying gas are bottomed in the Trenton, though in many instances secondary contributions are derived from the overlying Utica shale. Elsewhere, as in Oneida and Jefferson counties, these limestones have not afforded any durable supply.

The next higher horizon of importance is at the base of the Lower Siluric and includes the Medina sandstone and its eastern representative, the Oswego sandstone. The occurrence of pools in this formation is of recent discovery, but they now yield a very large portion of the production. The principal field, opened since 1890, is in Erie county beginning near Buffalo and extending eastward through the towns of Cheektowaga, Amherst, Lancaster, Clarence, Alden and Newstead. A second field occurs south of Buffalo between that city and Jewettville. The wells at Avon and Caledonia, Livingston co., are said to reach the Medina. In the last two years large pools have been encountered in what is regarded as the white Medina sandstone in northern Chautauqua county, notably at Westfield and Silver Creek. The recent discoveries at Pavilion, Genesee co., are likewise reported to be in that formation.

The remaining formations of the Lower Siluric are made up mostly of shales and limestones. They appear to be relatively poor reservoirs for gas.

In the Devonic system, practically all of the formations represented in western New York have been found to contain gas at one or more localities. The most prolific, undoubtedly, are the upper members, the Portage and Chemung shales and sandstones. They are tapped by numerous wells in Allegany, Cattaraugus and Chautauqua counties. The principal gas supplies are derived from southern Allegany and Cattaraugus counties, from the same fields which yield petroleum. Many of the wells yield both gas and oil, and a part of the gas is consumed locally in operating the oil pumps, while the remainder is run into pipe lines for distribution in the neighboring cities and villages. The original wells put down in the Lake Shore belt of Chautauqua county, at Fredonia, Brocton, Mayville and Ripley seem to have found the gas mainly in the Chemung shales. The deeper wells that were drilled later encountered reservoirs at different horizons below the Chemung, as far down as the Medina. T
Marcellus and Onondaga formations of the Devonic are c
sidered by Bishop[1] to be the sources of the gas at Gowand
northern Cattaraugus county.

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[1] Oil and Gas in Southwestern New York. N. Y. State Geol. 19th An. R
p. 116.

The geographical limits of the gas fields can only be broadly defined, but it is observable that with one or two exceptions they are situated in the western section of the State in the middle and southern tiers of counties. The wells of Oswego county, near the end of Lake Ontario, represent the most easterly points at which the presence of gas in quantity has been established, and there the pools seem to be confined to small areas. The disturbed condition of the strata has, no doubt, militated against the accumulation of gas in the eastern section of the State.

Production. There are about 850 productive gas wells distributed among the different counties and owned by 150 individuals and companies. Most of the wells in Chautauqua county are operated for private use and their combined output is small. Aside from them, the production is in the control of a relatively few companies who have pipe lines and distribute the gas for general consumption.

The production during the past four years is shown in the accompanying table, which gives the value of the output for the leading counties. The total value in 1907 amounted to $800,014, which is an increase of $33,435 over the value returned for the preceding year.

Production of natural gas

COUNTY	1904	1905	1906	1907
Allegany-Cattaraugus	$183 830	$204 430	$247 208	$250 159
Chautauqua	31 822	26 232	94 345	106 411
Erie	254 899	281 253	317 554	320 199
*a*Livingston	32 451	41 805	52 805	55 780
Onondaga	15 350	16 825	16 385	17 030
Oswego	14 990	13 583	13 182	10 585
*b*Wyoming	18 855	22 872	25 100	39 850
Total	$552 197	$607 000	$766 579	$800 014

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a Includes also Seneca, Schuyler, Steuben, Ontario and Yates counties.
b Includes also Niagara and Genesee counties.

The quantity of gas produced in 1907 was approximately 3,052,145,000 cubic feet. In arriving at this total, estimates are included for certain producers who were unable to supply exact figures, but as it is only the smaller operators who do not keep records of their wells, the estimate is very close to the actual production. No account is made, however, of the gas consumed by oil companies for pumping. The quantity of gas yielded by the wells in 1906 was 3,007,086,000 cubic feet, in 1905 2,639,130,000 cubic feet and in 1904 2,399,987,000 cubic feet. The average value of the natural gas varies according to locality from a minimum of 18 cents to a maximum of 50 cents a thousand cubic feet. The general average for the whole State in recent years has been about 25 cents.

New developments. There has been an average amount of drilling done during the past year and the additional supplies from new wells have more than sufficed to keep up the production.

In Chautauqua county, the Frost Gas Co. put down another well at Sheridan where it first began producing two years ago The new well is said to have given an indicated flow of 2,500,000 cubic feet a day. The South Shore Gas Co. also opened a successful well at a depth of 2100 feet at Sheridan. At Westfield the Welch Gas Co. drilled its fourth well, which attained a depth of 2340 feet. After shooting, a flow of 350,000 feet a day was registered, apparently from the Medina sandstone. In exploring for oil at Levant, in the southeastern part of the county, a gas reservoir was tapped at 1200 feet depth showing a pressure of 125 pounds. The exploration of a large tract of land near Gerry is in prospect where options have been secured for that purpose by O. M. Burdick and A. L. Shaner of Bolivar.

A well flowing 200,000 cubic feet a day was put down at Elma, Erie co., and others are to be drilled during the current year. It is intended to use the gas at Elma. A successful well has been located at Ebenezer by William Vogel, the reservoir being tapped at 1600 feet.

The Pavilion Natural Gas Co. continued drilling at Pavilion, Genesee co., where important discoveries were made in 1906. The company now has nine producing wells with an indicated capacity of 10,000,000 cubic feet. The gas is supplied to the villages of Leroy and Pavilion. A well drilled on the Charles Kane farm gave an estimated flow of 2,500,000 cubic feet
first opened. The Alden-Batavia Natural Gas Co. has
exploration at Darien in southwestern Genesee county.

A new development at Naples, Ontario co., is a
in the valley just west of the village. Gas was f
feet depth. There are four old wells on the east

During 1907 the exploration of the newly opened Short Tract or Granger district in northern Allegany county was carried on with vigor and additional discoveries are reported. This district was prospected to some extent five or six years ago, but without definitely establishing the presence of oil. The first of the productive wells is located on the Van Nostrand farm, 5 miles from Fillmore. An area of about 1000 acres in the vicinity has been proved to show good indications. The construction of a pipe to connect the wells with the railroad at Fillmore was begun during the year. The oil is clear and light in color and gravity, closely resembling the product from the Tiona field of Pennsylvania. Some of the wells when first opened flow under natural pressure.

Discoveries of oil were reported from Rexville, and in the town of Wayne, Steuben co., but as yet nothing definite can be stated concerning their importance.

PYRITE

As was anticipated in the preceding issue of this report, the pyrite industry of St Lawrence county experienced a notable advance during the past year. The production amounted to 49,978 long tons, as compared with 11,798 long tons in 1906 and 10,100 long tons in 1905, and was the largest ever recorded in the State. The St Lawrence Pyrite Co. at Stellaville and the American Pyrites Co. at Gouverneur were in active operation, the latter company, however, closing down its plant in July.

The property of the St Lawrence Pyrite Co. is situated 1 mile north of Hermon and includes the old Stella mine, the first to be opened in the district. This is not worked at present. The ore is taken from two new mines, to the southeast of the Stella shaft, developed since 1904 when the present company acquired the property. Most of the output is obtained from the mine adjacent to the mill. The other mine, situated ¼ mile south, is still in the development stage though producing some ore. An average of from 250 to 300 tons daily is mined. The whole mine output goes to the mill where it is concentrated to a product assaying from 47 to 48 per cent sulfur. A preliminary crushing is performed at the mine shafts by means of jaw crushers which discharge directly into cars. The ore passes through a Gates gyratory crusher and rolls at the mills. The first concentration is effected by Hancock jigs, while the middlings from this treatment are recrushed by rolls and reconcentrated on Hartz jigs. The slimes are passed over Overstrom tables. The mill has a nominal capacity of 500 tons crude ore a day.

The ore bodies have much similarity of shape and geological relations to the magnetites of the western Adirondacks. They are of lenticular form with their axes of extension alined parallel to the foliation of the wall rock, but often show a pitch across the dip. They range up to 30 feet thick. They occur in overlapping series sometimes closely set and again separated by varying thicknesses of the wall rock. The country is a dark hornblende-biotite schist belonging to the sedimentary or Grenville series of Adirondack formations.

The pyrite occurs in coarse particles and aggregates which only occasionally show crystal boundaries. The gangue consists mainly of vein quartz. Zinc blende is a common accompaniment, and pyrrhotite is encountered at times in considerable bodies. Though inclosed by sediments the deposits can scarcely be construed as original beds of contemporaneous formation, but their genesis probably has been parallel to that of the magnetites found in the Grenville which are always pyritic and not rarely richly so. There are no well defined walls, for the mineralization extends outward into the schist for some distance beyond the limits of the pay ore. The pyrite seems to have impregnated and replaced the schist to a great extent, at the same time filling small fissures and seams along the bedding planes. Its origin is traceable to iron-bearing solutions which have circulated through the schist when it was probably at considerable depth from the surface and perhaps in a less metamorphosed condition.

The crude ore carries about 30 per cent sulfur. An analysis of Stella ore showed the following percentages:

Silica	32
Iron	32
Sulfur	32
Copper	.04
Gold and silver	traces

The amount credited to silica probably includes the insoluble constituents, such as feldspar, hornblende, biotite and other silicates of the schist as well as quartz. The pyrite is free from grades inasmuch as the salt consumed by the Solvay Process Co. bears only a nominal value.

Production of salt by grades in 1906

GRADE	BARRELS	VALUE	VALUE PER BARREL
Common fine	1 164 064	$413 462	$ .35
Common coarse	182 636	62 758	.34
Table and dairy	1 211 936	603 034	.50
Coarse solar	510 800	191 551	.38
Packers	39 286	14 100	.36
[a]Other grades	5 905 271	846 745	.14
Total	9 013 993	$2 131 650	$ .23

[a] Includes rock salt, salt in brine used for soda manufacture, and small amounts of brine salt for which the uses were not specified in the returns.

Production of salt by grades in 1907

GRADE	BARRELS	VALUE	VALUE PER BARREL
Common fine	1 214 093	$446 618	$ .37
Common coarse	155 593	64 794	.42
Table and dairy	1 183 643	639 464	.54
Coarse solar	415 971	156 072	.37
Packers	43 614	14 993	.34
[a]Other grades	6 644 629	1 127 237	.17
Total	9 657 543	$2 449 178	$ .25

[a] Includes rock salt, salt in brine used for soda manufacture, and small amounts of brine salt for which the uses were not specified in the returns.

Onondaga county ranks first among the counties of the State in quantity of annual output and has contributed by far the largest total production. Between the years 1797 and 1892 there was made and sold from the Onondaga Salt Springs an aggregate of 71,284,419 barrels, equivalent to 9,979,819 short tons. If the salt utilized for soda manufacture be also included, the production of the county to date can not be much less than 20,000,000 tons. Up to the year 1880, when the beds of rock salt in the western part of the State began to be utilized, Onondaga county supplied the whole output, but since then it has gradually lost its importance in the trade and the greater part of the total now returned for the county represents the salt in brine consumed for soda manufacture.

The relative rank of the counties of the State, according to their output of marketable salt in 1907, was as follows: Livingston, Wyoming, Tompkins, Schuyler, Onondaga and Genesee.

Livingston county furnishes the entire product of rock salt which is mined at Retsof and Cuylerville. The Retsof Mining Co. has worked a deposit at the former locality for many years. The Sterling Salt Co. at Cuylerville began production in the fall of 1906 and the past year was the first one in which the mine was continuously active.

The growth of the salt industry in New York during the past 25 years is illustrated by the accompanying table which covers the output for the period 1883–1907 inclusive. It is noticeable that while the production has increased nearly six times during the period, the value of the annual total has grown at a much smaller rate. The figures for the years previous to 1904 are taken from the annual volumes of the *Mineral Resources*.

Production of salt in New York since 1883

YEAR	BARRELS	VALUE
1883	1 619 486	$680 638
1884	1 788 454	705 978
1885	2 304 787	874 258
1886	2 431 563	1 243 721
1887	2 353 560	936 894
1888	2 318 483	1 130 409
1889	2 273 007	1 136 503
1890	2 532 036	1 266 018
1891	2 839 544	1 340 036
1892	3 472 073	1 662 816
1893	5 662 074	1 870 084
1894	6 270 588	1 999 146
1895	6 832 331	1 943 398
1896	6 069 040	1 896 681
1897	6 805 854	1 948 759
1898	6 791 798	2 369 323
1899	7 489 105	2 540 426
1900	7 897 071	2 171 418
1901	7 286 320	2 089 834
1902	8 523 389	1 938 539
1903	8 170 648	2 007 807
1904	8 724 768	2 102 748
1905	8 575 649	2 303 067
1906	9 013 993	2 131 650
1907	9 657 543	2 449 178

SAND

The resources of the State in sands adapted for building, metallurgical and other uses are extensive and suffice to meet most of the local requirements for the material. The building and construction trades call for the largest quantity, consuming several millions of tons annually of the common grades which are obtained in great part within the immediate vicinity of the markets. Molding sands, glass sand, furnace sand, fire sand and filtration sands are among the other kinds produced, some of which are shipped to points without the State.

Building sand. The glacial deposits which are found in nearly all sections afford an abundance of sand for building and construction purposes. The deposits may be mixed with gravel, boulders and clay, requiring some preparation of the sand by screening or washing before it can be used. Frequently, however, the materials have been sorted by natural processes so that beds yielding clean and evenly sized sand may be found. The supplies of sand used in building operations in Albany and Rochester are derived from local morainal deposits. Alluvial sand found along the stream valleys is employed in many localities in the interior of the State. Beach sand also enters into the trade; most of the building sand consumed in New York city is obtained from the shores of Long Island, and Buffalo derives its supply from the beaches of Lake Erie principally from the northern or Canadian shore.

The extent of the trade in building sand is indicated by the statistics collected by the United States Geological Survey, according to which the production of New York in 1906 amounted to 3,369,194 short tons valued at $1,045,844. Large as the total is, it perhaps falls short of the actual production, since there is great difficulty in obtaining complete information on the subject. Little capital is represented in the individual enterprises and they are mostly of transitory nature, so that many changes take place each year. The intrinsic value of the product, aside from the costs of labor and transportation, is small.

Glass sand. For the manufacture of glass, pure quartz sand is required. The presence of dark minerals such as magnetite, hornblende, biotite, etc., which carry iron, is particularly objectionable. In the manufacture of window glass and articles of common glass, the iron is kept down to a small fraction of one per cent, while for the finer grades no more than a trace is allowable.

The glass sand produced in New York comes from the vicinity of Oneida lake. The principal localities where it is found are in the towns of Rome, Verona and Vienna, Oneida co., and Constantia, Oswego co. At one time this section supported a large industry in the manufacture of window glass, with factories at Durhamville, Constantia and Cleveland, but the cost of fuel became a serious handicap when competition was encountered with centers of manufacture in the natural gas and soft coal regions. Small quantities of the sand are now shipped to other parts of the State for making bottles and common wares. The shipments in 1907 amounted to 1200 short tons valued at $1380.

Some of the sandstones of New York have been used in the past for glass making. The Shawangunk grit was once quarried near Ellenville, Ulster co., and the output sold to Pennsylvania companies. The Potsdam sandstone has likewise been used for the purpose.

Molding sand. This material is produced largely along the Hudson river valley, in Albany, Columbia and Dutchess counties. The deposits are a part of the water-washed glacial accumulations of the region and are found in the upper section immediately underlying the soil. The valuable portion ranges from a few inches up to several feet thick. The sand contains a little clayey matter which contributes to its firmness and plasticity. The finest grades are used for stove and other castings that require a smooth finish and are shipped to Albany, Troy and more distant points. Sand used for making cores in molding is obtained from Oneida lake, from the same deposits that yield glass sand.

SAND-LIME BRICK

There have been few changes in this industry during the year. The activity shown in the erection of new plants for the manufacture of sand-lime brick was less noticeable than in the preceding year, no doubt due in part to the smaller demand that has been experienced for building materials of all kinds. Reports were received from 12 plants, of which nine were operat
during the whole or part of the year, and the prod
amounted to 16,610,000 valued at $109.677. The sever
that reported as active in 1906 made an output of
valued at $122,340. The plant of the Rochester Com
Co. was destroyed by fire but is to be replaced. T
is a list of the companies engaged in the industry i

NAME	LOCATION
Buffalo Sandstone Brick Co.	Buffalo
Granite Brick Co.	Glens Falls
Granite Brick Co.	Sandy Hill
Lancaster Sand-Lime Brick Co.	Lancaster
Newburgh Sand-Lime Brick Co.	Newburgh
Paragon Plaster Co.	Syracuse
Rochester Composite Brick Co.	Rochester
Roseton Sand-Lime Brick Co.	Roseton
F. W. Rourke & Co.	Brooklyn
Sand Stone Brick Co.	Schenectady
Schenectady Brick Co.	Schenectady
Watertown Sand Brick Co.	Watertown

SLATE

The quarrying of slate in New York is restricted at present to a small district in eastern Washington county. The district extends north from Salem through the towns of Hebron, Granville, Hampton and Whitehall and is practically continuous with the Vermont slate district which has attained much greater importance in the industry. The slate occurs in several horizons among the metamorphosed Paleozoic strata of the region, but belongs mostly to the Cambric and Lower Siluric systems. Extensive slate beds are found also in the southern continuation of the metamorphic region along the east side of the Hudson river, in Rensselaer, Columbia and Dutchess counties. Attempts to work the slate in this section, however, have not been permanently successful, though it is recorded that quarries were operated for a time at Hoosick, New Lebanon and New Hamburg.

The slate from Washington county is remarkable for its variety of colors. The red slate which is obtained near Granville and in the Hatch Hill and North Granville sections has no superior for beauty and permanency, while purple, variegated and different shades of green slate occur in the southern section around Middle Granville, Salem and Shushan. Nearly all of the product is sold for roofing purposes. The manufacture of other materials such as mantels, floor tiling, blackboards, billiard tables, etc., is not carried on to any extent in the State.

The production of slate for the past year amounted in value to $53,625. Of this, roofing slate represented $52,450 and mill stock $1175. The number of squares of roofing slate made was 11,686. In 1906 the total production was valued at $61,921 consisting of 16,248 squares of roofing slate valued at $57,771 and mill stock valued at $4150. The average value of roofing slate for the year was $4.60 a square against $3.56 a square in 1906. The increased value was due more to the relatively large quantity of red slate produced than to higher market prices.

STONE

The quarry industries of New York are of large and growing importance. There are few other states that possess such a variety of geological formations with so many different rock members. The resources afford almost every kind of material used for building and construction purposes and many of the ornamental stones. Still the local product falls short of meeting the requirements, specially for building and decorative stones, and large quantities are brought in annually from other states or are imported from foreign countries.

The statistics and notes incorporated in the following pages relate to the different quarry industries of the State, except those of slate and millstones, which are treated under their own titles elsewhere in this report.

Production of stone

The value of the quarry materials produced in 1907 amounted in the aggregate to $7,890,327. The total for the preceding year was $6,504,165, showing a gain of $1,386,162, or about 20 per cent. Nearly one half of the amount consisted of limestones which accounted for a total of $3,182,447 as compared with $2,963,829 in 1906. The sandstone quarried was valued at $1,998,417 against $1,976,829 in the preceding year, the larger part contributed by the companies engaged in the bluestone trade. The marble quarries reported the largest increase for the year, the production having a value of $1,571,936, as compared with $460,915 in 1906. The output of granite showed a small falling off, with a total value of $195,900 in 1907 and $255,189 in the preceding year.

Classified as to uses, crushed stone was the largest item in the total and represented a value of $2,812,998, an increase of nearly $400,000 for the year. The use of crushed stone in road improvement work and for making concrete has been the chief factor in the development of this branch of the industry which has nearly doubled in importance within the last three years. The quantity of crushed stone made last year was approximately 3,319,706 cubic yards, as compared with 3,132,460 cubic yards in 1906. The quantity reported as used for road metal was

854,720 cubic yards, against 905,750 cubic yards in 1906. This total, however, does not represent the full amount thus used, as some of the firms are unable to classify their product. The value of the building stone, rough and dressed, amounted to $2,208,545, against $1,408,583 in 1906. Curb and flagstone aggregated the sum of $1,064,193 as compared with $999,678, represented largely by bluestone. The monumental stone, principally marble, was valued at $162,359, against $103,219 in 1906. The value of the stone quarried for purposes other than those given, including lime, furnace flux, paving blocks, riprap, rubble, etc., was $1,642,232, as compared with $1,557,192 in 1906.

Production of stone in 1905

VARIETY	BUILDING STONE	MONUMENTAL	CURBING AND FLAGGING	CRUSHED STONE	ALL OTHER	TOTAL VALUE
Granite..........	$139 414	$10 431	*a*	$69 748	$34 362	$253 955
Limestone........	246 300	....	$7 297	1 193 800	964 059	2 411 456
Marble...........	571 810	177 557	*a*	*a*	25 190	774 557
Sandstone........	530 485	....	1 029 913	37 406	446 156	2 043 960
Trap.............	*a*	....	....	601 669	21 550	623 219
Total........	$1 488 009	$187 988	$1 037 210	$1 902 623	$1 491 317	$6 107 147

a Included under "All other."

Production of stone in 1906

VARIETY	BUILDING STONE	MONUMENTAL	CURBING AND FLAGGING	CRUSHED STONE	ALL OTHER	TOTAL VALUE
Granite..........	$231 190	$4 119	*a*	$13 980	$5 900	$255 189
Limestone........	229 479	....	$8 067	1 590 205	1 136 078	2 963 829
Marble...........	337 365	99 100	*a*	*b*	24 450	460 915
Sandstone........	610 549	*a*	991 611	51 205	323 464	1 976 829
Trap.............	*a*	....	....	780 103	67 300	847 403
Total........	$1 408 583	$103 219	$999 678	$2 435 493	$1 557 192	$6 504 165

a Included under "All other." *b* Included under Limestone.

Production of stone in 1907

VARIETY	BUILDING STONE	MONUMENTAL	CURBING AND FLAGGING	CRUSHED STONE	ALL OTHER	TOTAL VALUE
Granite..........	$84 774	$9 613	*a*	$92 950	$8 563	$195 900
Limestone........	189 782	....	$13 123	1 725 203	1 254 339	3 182 447
Marble...........	1 408 190	152 746	*a*	*b*	11 000	1 571 936
Sandstone........	525 799	....	1 051 070	55 818	365 730	1 998 417
Trap.............	*a*	....	....	939 027	2 600	941 627
Total........	$2 208 545	$162 359	$1 064 193	$2 812 998	$1 642 232	$7 890 327

a Included under "All other." *b* Included under Limestone.

Granite

Under the head of granite are grouped by the trade the crystalline rocks in which feldspar and other silicates are the predominant minerals. Besides granite in the strict sense the class comprises syenite, diorite, gabbro and anorthosite, in fact practically all of the igneous rocks, as well as many gneisses and schists, that are adapted for building construction or ornamental purposes. The fine grained crystalline rocks known as trap, however, are usually separated from the class owing to their somewhat special qualities and will be treated here under their own title.

There are two principal areas where these rocks occur in New York, the one being the Adirondack region and the other the lower Hudson valley and the bordering highlands. Both regions afford a variety of both massive and gneissoid types in great abundance, yet the quarries have not been developed as yet on a scale at all commensurate with the local markets. The present output represents but a fraction of the granite actually used each year for building or other purposes; by far the greater part is brought in from other states and some is imported from foreign countries.

The returns received from the quarries for 1907 show an output valued at $195,900, as compared with a value of $255,189 for the preceding year. The value of the building stone quarried was $84,774 against $231,190 in 1906, the decrease being due to the smaller operations in the quarries of Westchester county which supply building stone to New York city. The production of granite for other purposes was as follows: monumental stone, $9613, against $4119 in 1906; crushed stone, $92,950 against $13,980; rubble and riprap, $5600 against $2423; paving blocks, curbing and miscellaneous, $2963, against $3477. The quantity of crushed stone made was approximately 111,150 cubic yards against 16,800 cubic yards in 1906. Westchester county contributed a production valued at $76,820, as compared with $172,845 in the preceding year. The remainder of the production was distributed among the following counties: Clinton, Essex, Fulton, Herkimer, Jefferson, New York and Warren counties. There were 14 quarries operated during the year, or five less than in 1906.

Production of granite

MATERIAL	1905	1906	1907
Building stone	$139 414	$231 190	$84 774
Monumental	10 431	4 119	9 613
Crushed stone	69 748	13 980	92 950
Rubble, riprap	30 125	2 423	5 600
Other kinds	4 237	3 477	2 963
Total	$253 955	$255 189	$195 900

Quarries for furnishing crushed stone have been opened at Little Falls where there is an extensive intrusion of the Adirondack syenite. The crushing plant of the John Pierce Co. on the north side of the Mohawk river is the largest in the State, and produces road metal, railroad ballast and concrete material. Another quarry on the south side of the river has recently been equipped with a plant for making concrete blocks. The quarries are advantageously situated for shipment of their product both by railroad and the canal system of the State and should command a wide market.

The Picton Island Red Granite Co. has been engaged in quarrying on Picton island in the St Lawrence river. The stone is a biotite granite, ranging from medium to fine in texture, and has a very attractive reddish color, verging toward pink in the fine grained variety. Similar granites have been quarried in the vicinity for many years and have gained a wide repute for their beauty and durability. The present quarries have furnished building material chiefly, but the stone is well adapted for monumental and decorative work as well. It has a specific gravity of 2.653 and a crushing strength of 16,500 pounds to the square inch.

The Adirondack anorthosite affords in some places a gray or bluish gray massive stone often showing the very pleasing effect of a porphyry when polished. It has been quarried on a small scale, principally for monumental purposes. The opening of new quarries near Ausable Forks, Clinton co. is contemplated by Mr Ernest Leblond who has also a quarry property in Adirondack syenite in the same vicinity.

Limestone

The limestone quarries are first in importance among the stoneworking industries of the State. Compared with sandstone which ranks second in value of output, limestone is not so generally used as building material, but it finds extensive employment for road metal and concrete. Its wide occurrence in connection with a natural fitness for the purpose, has favored the development of a large crushed stone business that covers nearly every section of the State. The manufacture of lime is also an important industry, requiring a considerable proportion of the quarry output.

The noncrystalline limestones, which are considered under this head, comprise a variety of rocks as regards their geological occurrence and physical and chemical characters. They are distributed among the Cambric, Lower Siluric, Siluric and Devonic systems. In a few localities, the crystalline limestones or marbles of the Precambric are quarried for lime making and such production is reported as limestone. In their chemical composition the limestones of New York show a range from practically pure lime carbonates to magnesian limestones and dolomites and to silicious, aluminous or ferruginous types in which the carbonates play a subordinate rôle. Light colored and white limestones are not abundant, however, in the State, the prevailing colors being grayish or drab, and for this reason considerable quantities of such stone are brought in from other States, principally Ohio and Indiana.

Production of limestone

MATERIAL	1905	1906	1907
Crushed stone	$1 193 800	$1 590 205	$1 725 203
Lime made	702 684	795 348	888 309
Building stone	246 300	229 479	189 782
Furnace flux	198 168	287 816	338 127
Rubble, riprap	40 664	32 975	14 588
Flagging, curbing	7 297	8 067	13 123
Miscellaneous	22 543	19 939	13 135
Total	$2 411 456	$2 963 829	$3 182 447

The total production of the limestone quarries last year amounted in value to $3,182,447. This is exclusive of the stone used in the Portland and natural cement industries, for which no statistics have been collected. Compared with the previous year there was a gain of $218,618 in the valuation or about seven per cent. The product was distributed among 35 counties of the State with a total of 136 active quarries.

Crushed stone for road metal, concrete, etc., represents the largest item in the output. The value of this material was $1,725,203 against $1,590,205 for 1906. The manufacture of lime is second in importance with a product valued at $888,309 in 1907 and $795,348 in 1906. Building stone represented a value of $189,782, as compared with $229,479 in the preceding year. Limestone used as flux in metallurgical processes accounted for $338,127 against $287,816. Other items are: rubble and riprap valued at $14,588 against $32,975; flagging and curbing $13,123 against $8067; and miscellaneous materials, not classified in the returns, valued at $13,315, as compared with $19,939 in the preceding year.

Distributed according to counties in which the limestone was quarried, the largest producer was Erie county which reported an output valued at $516,727, consisting principally of building stone, crushed stone and furnace flux. This county also ranked first in 1906 with a valuation of $525,381. Onondaga county which returned a total of $479,780 was second as in 1906 when its output amounted to $391,457. It manufactures more lime than any other county in the State. The remaining counties which reported a value of over $100,000 each with their respective totals are here given, the figures in parentheses being the corresponding totals for 1906: Dutchess $399,244 ($368,927); Rockland $284,800 ($242,184); Genesee $283,513 ($227,062); Warren $225,262 ($205,832); Westchester $156,957 ($143,168); Albany $129,220 ($106,800); and Clinton $110,560 ($96,925).

Lime. There were 38 firms that reported an output last year of limestone (including marble) for lime burning, either as a main product or in connection with the quarrying of other materials. The greater portion of the limestone was converted by the companies operating the quarries. In all 18 counties participated in the production. The quantity of lime made was 403,114 short tons valued at $888,309. Onondaga county reported a product of 295,293 short tons, or about 73 per cent of the whole amount.

In the preceding year the output amounted to 313,369 short tons valued at $795,348, of which Onondaga county contributed 208,250 tons. The importance of the industry in this county is to be ascribed to the operations of the Solvay Process Co. which uses the lime as a reagent in the manufacture of soda products.

The production in the other leading counties for 1907 and 1906 respectively was as follows, in short tons: Warren 45,747 (39,076); Clinton 14,800 (16,400); Washington, 13,600 (12,000); Lewis 11,251 (9500); Jefferson 6482 (10,450); Westchester 6029 (7353).

It will be noted that the value of the production as above given is considerably less than the commercial price; this is due to the fact that a nominal valuation has been placed upon the portion used as a chemical reagent. Disregarding the quantity thus consumed, the value of the lime made for the market averaged $4.47 a short ton in 1907 and $4.58 a short ton in 1906.

Crushed stone. Limestone is more generally employed in New York for crushing than any other kind of stone. The total production in 1907 amounted to 2,211,102 cubic yards valued at $1,725,203, as compared with 2,194,547 cubic yards valued at $1,590,205 in the preceding year. Of the quantities given, 363,589 cubic yards in 1907 and 486,750 cubic yards in 1906 were returned as having been used for road metal, though the amounts thus employed probably exceeded these totals, since some firms do not keep any records as to the disposal of their product.

The leading counties in the production of crushed stone, with their outputs in cubic yards, are as follows, the figures for 1906 being in parentheses: Dutchess 426,744 (400,177); Rockland 390,368 (373,387); Genesee 344,160 (323,128); Erie 250,720 (289,110); Albany 203,000 (150,000); Westchester 132,566 (105,441); and Onondaga 103,546 (92,950).

Building stone. The use of the local limestones for building purposes shows little or no tendency toward expansion, notwithstanding the important increases in the other materials supplied by the quarries. The value of the building limestone, rough and dressed, produced in 1907 was $189,782 as compared with a value of $229,479 in 1906. Erie county has the largest quarries of building stone, its output amounting in value to $114,351 as compared with $118,806 in the preceding year. The remaining counties are small producers. The output each year is supplement by large quantities of limestone that are brought in from ot states.

blocks for building and construction purposes. There are a few quarries that have been worked specially for building marble.

The quarries of southeastern New York are located in the metamorphic belt extending from Columbia county, through Dutchess and Westchester to Manhattan island. White and light gray marbles are the characteristic products and are sold principally for building purposes. The South Dover Marble Co. owns quarries of white marble at South Dover, Dutchess co., which have furnished material for many buildings in New York and other cities. The marble is generally recognized as one of the best of the kind. It is employed also for interior work. The Waverly Marble Co. with quarries at Tuckahoe, Westchester co., has been a large producer of building marble, which has been used in many notable structures. It is white but coarser grained than the South Dover marble. Among other localities in this region where quarries have been worked are Ossining, Dobbs Ferry, White Plains, Oscawana and Pleasantville, Westchester co., and Greenport, Columbia co. Some of the quarries furnish material for lime making.

The production of marble during the past year amounted to a value of $1,571,936 which is much the largest total that has been reported by the New York State quarries. The value was distributed among the different kinds of marble as follows: building marble, rough and dressed, $1,408,190; monumental marble, rough and dressed, $152,746; other kinds, $11,000. The corresponding total for 1906 was $460,915, and was divided into: building marble, $337,365; monumental, $99,100; other kinds, $24,450. The value of the marble quarried last year in southeastern New York aggregated $1,252,000 against $260,350 in 1906. St Lawrence county reported an output valued at $297,936 against $136,835 in the preceding year. A new producer in this county is John J. Sullivan who has worked the Davidson marble quarry, 2 miles southwest of Gouverneur.

Production of marble

VARIETY	1905	1906	1907
Building marble	$571 810	$337 365	$1 408 190
Monumental	177 557	99 100	152 746
Other kinds	25 190	24 450	11 000
Total	$774 557	$460 915	$1 571 936

Sandstone

Under the head of sandstone are included the sedimentary rocks which consist essentially of quartz grains held together by some cementing substance. Among the varieties, distinguished mainly by textural features, are sandstones proper, conglomerates, grits and quartzites.

The wide distribution of sandstones in the geologic series of New York State, together with their adaptability to many uses, has given them great economic importance, and in value of the annual output they rank second only to limestone among the quarry materials. Nearly all the formations above the Archean contain sandstones at one or more horizons. The kinds chiefly quarried in New York are the Potsdam, Hudson River, Medina and the Devonic sandstones. A few quarries have been opened also in the Shawangunk conglomerate and the Clinton sandstone.

The fine grained evenly bedded strata that occur in the Devonic are popularly known as bluestone, a term first applied to them in Ulster county where they are distinguished by a bluish gray color. The name, however, no longer has its original significance and is here used generally for the sandstones found within the Devonic belt which stretches across the southern part of the State. Much of the bluestone possesses the property of splitting regularly along planes parallel to the bedding which renders the stone specially serviceable for flagging and curbing.

Production of sandstone

The total value of the sandstone quarried in New York last year was $1,998,417, or a little more than that for 1906 which was $1,976,829. The production was made in 35 counties by over 400 individuals and companies.

Classified as to uses the values for 1907 and 1906 (in parentheses) are divided into: building stone, rough, $220,718 ($343,077); building stone, dressed, $305,081 ($267,472); curbing, $599,053 ($553,085); flagging, $452,017 ($438,526); paving blocks, $320.301 ($282,063); crushed stone for roads, $13,799 ($14,677); crushed stone for other purposes, $42,019 ($36,528); rubble, etc., $24,812 ($11,661); all other kinds, $20,617 ($29,740). There was a small decrease in the value of building stone; the other materials held their own or showed small gains.

The following tables give the value of the production distributed among the leading districts of the State.

Production of sandstone in 1906

DISTRICT	BUILDING STONE	CURBING AND FLAGGING	PAVING BLOCKS	CRUSHED STONE	RUBBLE, RIPRAP	ALL OTHER
Bluestone						
Hudson river...	$70 816	$220 961	$14 228	....	....	....
Delaware river..	110 008	572 470	1 350	$700	$1 188	....
Chenango co...	85 576	41 985	....	....	2 678	....
Wyoming co...	234 280	....	....	550	843	$140
Other districts..	12 658	4 247	....	2 770	....	325
Total bluestone.	$513 338	$839 663	$15 578	$4 020	$4 709	$465
Sandstone						
Orleans county.	$50 845	$147 438	$260 878	$225	$552	$25 000
Other districts..	46 366	4 510	5 607	46 960	6 400	4 275
Total sandstone.	$97 211	$151 948	$266 485	$47 185	$6 952	$29 275
Combined total.	$610 549	$991 611	$282 063	$51 205	$11 661	$29 740

Production of sandstone in 1907

DISTRICT	BUILDING STONE	CURBING AND FLAGGING	PAVING BLOCKS	CRUSHED STONE	RUBBLE, RIPRAP	ALL OTHER
Bluestone						
Hudson river...	$60 613	$219 357	$13 925	....	....	....
Delaware river..	66 627	633 600	873	....	$1 528	$800
Chenango co...	62 302	28 380	175	$500	1 029	14 317
Wyoming co...	195 155	659	....	....	955	....
Other districts..	7 123	1 484	2 400	4 125	....	....
Total bluestone.	$391 820	$883 480	$17 373	$4 625	$3 512	$15 117
Sandstone						
Orleans co.....	$85 750	$139 140	$296 928	$15 500	$800	$4 100
Other districts..	48 229	28 450	6 000	35 693	20 500	1 400
Total sandstone.	$133 979	$167 590	$302 928	$51 193	$21 300	$5 500
Combined total.	$525 799	$1 051 070	$320 301	$55 818	$24 812	$20 617

The value of the bluestone quarried in 1907 was $1,315,927, or approximately 65 per cent of the total output; the value of the other sandstone quarried was $682,490 or 35 per cent of the total. Compared with the preceding year, the returns show a falling off in the bluestone trade, due mainly to the smaller output of building stone, the decrease being distributed over all the different districts. There was little change in the values of the other materials from those reported in 1906. The combined total of sandstone quarried on the other hand showed an increase.

The production of bluestone by districts was as follows, the figures for 1906 being in parentheses: Hudson river $293,895 ($306,005); Delaware river $703,428 ($685,716); Wyoming county $196,769 ($235,813); Chenango county $106,703 ($130,239); other districts $15,132 ($20,000). In the Hudson river district of Albany, Greene and Ulster counties, about 65 per cent of the output in 1907 was sold as flagstone and curbstone and about 21 per cent as building stone. In the Delaware river district including Sullivan, Delaware and Broome counties, the value of the flagstone and curbstone sold amounted to about 88 per cent and the building stone to 11 per cent. In Chenango county about 60 per cent of the entire product was marketed as building stone, while in Wyoming county practically the whole output consisted of that material.

The production of Medina sandstone in Orleans county last year was valued at $542,218, as compared with $484,938, the value of the output in 1906. This stone has come into wide use for street work owing to its durability and even wear, and is also an attractive building material. The quarries at Albion, Medina, Holley, etc., are large and well equipped.

Trap

The term trap is commonly applied to the dark fine grained igneous rocks occurring as dikes or sheetlike intrusions. The variety known as diabase, composed essentially of plagioclase feldspar and pyroxene in small interlocking crystals, is the most common in New York State. The dikes are well distributed throughout the eastern Adirondacks, particularly in Clinton and Essex counties, but they are usually too small to be workable. The dikes near Greenfield, Saratoga co., and at Little Falls, Herkimer co., are exceptional in size for that region, having a thickness of 200 feet or more. By far the largest occurrence in the State is that on the west side of the Hudson river, south of Haverstraw, which forms the remarkable scenic feature known as the Palisades. The southern end of this intrusion is found on Staten Island where it extends southwest from Port Richmond.

The principal use of trap is for crushed stone for roadma

Canisteo, natural gas, 48.
Carbonate, 35.
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New York State Education Department

New York State Museum

JOHN M. CLARKE, Director

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Museum annual reports 1847–date. *All in print to 1892, 50c a volume, 75c in cloth; 1892–date, 75c, cloth.*

These reports are made up of the reports of the Director, Geologist, Paleontologist, Botanist and Entomologist, and museum bulletins and memoirs, issued as advance sections of the reports.

Director's annual reports 1904–date.

These reports cover the reports of the State Geologist and of the State Paleontologist. Bound also with the museum reports of which they form a part.

Report for 1904. 138p. 20c. 1905. 102p. 23pl. 30c. 1906. 186p. 41pl. 35c. 1907. *In press.*

Geologist's annual reports 1881–date. Rep'ts 1, 3–13, 17–date, O; 2, 14–16, Q.

In 1898 the paleontologic work of the State was made distinct from the geologic and was reported separately from 1899–1903. The two departments were reunited in 1904, and are now reported in the Director's report.

The annual reports of the original Natural History Survey, 1837–41, are out of print.

Reports 1–4, 1881–84, were published only in separate form. Of the 5th report 4 pages were reprinted in the 39th museum report, and a supplement to the 6th report was included in the 40th museum report. The 7th and subsequent reports are included in the 41st and following museum reports, except that certain lithographic plates in the 11th report (1891) and 13th (1893) are omitted from the 45th and 47th museum reports.

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See first note under Geologist's annual reports.

Bound also with museum reports of which they form a part. Reports for 1899 and 1900 may be had for 20c each. Those for 1901–3 were issued as bulletins. In 1904 combined with the Director's report.

Entomologist's annual reports on the injurious and other insects of the State of New York 1882–date.

Reports 3–20 bound also with museum reports 40–46, 48–58 of which they form a part. Since 1898 these reports have been issued as bulletins. Reports 3–4, 17 are out of print, other reports with prices are:

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6	.15	12	.25	19 (" 21)	.15
7	.20	13	.10	20 (" 24)	.40
8	.25	14 (En 5)	.20	21 (" 26)	.25
				22 (" 28)	.25

Reports 2, 8–12 may also be obtained bound separately in cloth at 25c in addition to the price given above.

Botanist's annual reports 1867–date.

Bound also with museum reports 21–date of which they form a part; the first Botanist's report appeared in the 21st museum report and is numbered 21. Reports 21–24, 29, 31–41 were not published separately.

Separate reports for 1871–74, 1876, 1888–98 are out of print. Report for 1899 may be had for 20c; 1900 for 50c. Since 1901 these reports have been issued as bulletins [*see* Bo 5–9].

Descriptions and illustrations of edible, poisonous and unwholesome fungi of New York have also been published in volumes 1 and 3 of the 48th (1894) museum report and in volume 1 of the 49th (1895), 51st (1897), 52d (1898), 54th (1900), 55th (1901), 56th (1902), 57th (1903) and 58th (1904) reports. The descriptions and illustrations of edible and unwholesome species contained in the 49th, 51st and 52d reports have been revised and rearranged, and, combined with others more recently prepared, constitute Museum memoir 4.

Museum bulletins 1887–date. O. *To advance subscribers, $2 a year or $1 a year for division* (1) *geology, economic geology, paleontology, mineralogy; 50c each for divisions* (2) *general zoology, archeology and miscellaneous,* (3) *botany,* (4) *entomology.*

Bulletins are also found with the annual reports of the museum as follows:

Bulletin	*Report*	*Bulletin*	*Report*	*Bulletin*	*Report*	*Bulletin*	*Report*
G 1	48, v.1	M 4	59, v.2	En 7–9	53, v.1	Ar 3	52, v.1
2	51, v.1	Pa 1	54, v.1	10	54, v.2	4	54, v.1
3	52, v.1	2,3	54, v.3	11	54, v.3	5	" v.3
4	54, v.4	4	" v.4	12, 13	" v.4	6	55, v.1
5	56, v.1	5,6	55, v.1	14	55, v.1	7	56, v.4
6	57, v.1, pt 1	7,9	56, v.2	15,18	56, v.3	8, 9	57, v.2
7–10	58, v.1	10	57, v.1, pt 1	19–22	57, v.1, pt 2	10, 11	58, v.4
11	59, v.1	11–14	58, v.3	23,24	58, v.5	Ms 1, 2	56, v.4
Eg 5, 6	48, v.1	15, 16	59, v.2	25,26	59, v.2		
7	50, v.1	Z 3	53, v.1	Bo 3	52, v.1		
8	53, v.1	4	54, v.1	4	53, v.1	*Memoir*	
9	54, v.2	5–7	" v.3	5	55, v.1	2	49, v.3
10	" v.3	8	55, v.1	6	56, v.4	3, 4	53, v.2
11	56, v.1	9	56, v.3	7	57, v.2	5, 6	57, v.3
12, 13	58, v.2	10	57, v.1, pt 1	8	58, v.4	7	" v.4
14, 15	59, v.1	11,12	58, v.4	9	59, v.2	8, pt 1	59, v.3
M 2	56, v.1	En 3	48, v.1	Ar 1	50, v.1	8, pt 2	59, v.4
3	57, v.1, pt 1	4–6	52, v.1	2	51, v.1		

The figures in parenthesis in the following list indicate the bulletin's number as a New York State Museum bulletin.

Geology. G1 (14) Kemp, J. F. Geology of Moriah and Westport Townships, Essex Co. N. Y., with notes on the iron mines. 38p. 7pl. 2 maps. Sep. 1895. 10*c*.

G2 (19) Merrill, F. J. H. Guide to the Study of the Geological Collections of the New York State Museum. 162p. 119pl. map. Nov. 1898. *Out of print.*

G3 (21) Kemp, J. F. Geology of the Lake Placid Region. 24p. 1pl. map. Sep. 1898. 5*c*.

G4 (48) Woodworth, J. B. Pleistocene Geology of Nassau County and Borough of Queens. 58p. il. 9pl. map. Dec. 1901. 25*c*.

G5 (56) Merrill, F. J. H. Description of the State Geologic Map of 1901. 42p. 2 maps, tab. Oct. 1902. 10*c*.

G6 (77) Cushing, H. P. Geology of the Vicinity of Little Falls, Herkimer Co. 98p. il. 15pl. 2 maps. Jan. 1905. 30*c*.

G7 (83) Woodworth, J. B. Pleistocene Geology of the Mooers Quadrangle. 62p. 25pl. map. June 1905. 25*c*.

G8 (84) —— Ancient Water Levels of the Champlain and Hudson Valleys. 206p. 11pl. 18 maps. July 1905. 45*c*.

G9 (95) Cushing, H. P. Geology of the Northern Adirondack Region. 188p. 15pl. 3 maps. Sep. 1905. 30*c*.

G10 (96) Ogilvie, I. H. Geology of the Paradox Lake Quadrangle. 54p. il. 17pl. map. Dec. 1905. 30*c*.

G11 (106) Fairchild, H. L. Glacial Waters in the Erie Basin. 88p. 14pl. 9 maps. Feb. 1907. *Out of print.*

G12 (107) Woodworth, J. B.; Hartnagel, C. A.; Whitlock, H. P.; Hudson, G. H.; Clarke, J. M.; White, David; Berkey, C. P. Geological Papers. 388p. 56pl. map. May 1907. 90*c*, *cloth.*

Contents: Woodworth, J. B. Postglacial Faults of Eastern New York.
Hartnagel, C. A. Stratigraphic Relations of the Oneida Conglomerate.
—— Upper Siluric and Lower Devonic Formations of the Skunnemunk Mountain Region.
Whitlock, H. P. Minerals from Lyon Mountain, Clinton Co.
Hudson, G. H. On Some Pelmatozoa from the Chazy Limestone of New York.
Clarke, J. M. Some New Devonic Fossils.
—— An Interesting Style of Sand-filled Vein.
—— Eurypterus Shales of the Shawangunk Mountains in Eastern New York.
White, David. A Remarkable Fossil Tree Trunk from the Middle Devonic of New York.
Berkey, C. P. Structural and Stratigraphic Features of the Basal Gneisses of the Highlands.

G13 (111) Fairchild, H. L. Drumlins of New York. 58p. 28pl. 19 maps July 1907. *Out of print.*

G14 (115) Cushing, H. P. Geology of the Long Lake Quadrangle. 88p. 20pl. map. Sep. 1907. 25*c*.

Fairchild, H. L. Later Glacial Waters in Central New York. *In press.*

Berkey, C. P. Geology of the Highlands of the Hudson. *In preparation.*

Cushing, H. P. Geology of the Theresa Quadrangle. *In preparation.*

Economic geology. Eg1 (3) Smock, J. C. Building Stone in the State of New York. 152p. Mar. 1888. *Out of print.*

Eg2 (7) —— First Report on the Iron Mines and Iron Ore Districts in the State of New York. 6+70p. map. June 1889. (Out of print.

Eg3 (10) —— Building Stone in New York. 210p. map, tab. Sep. 1890. 40*c*.

Eg4 (11) Merrill, F. J. H. Salt and Gypsum Industries of New York. 92p. 12pl. 2 maps, 11 tab. Ap. 1893. [50*c*]

Eg5 (12) Ries, Heinrich. Clay Industries of New York. 174p. 2pl. map. Mar. 1895. 30*c*.

Eg6 (15) Merrill, F. J. H. Mineral Resources of New York. 224p. 2 maps. Sep. 1895. [50*c*]

Eg7 (17) —— Road Materials and Road Building in New York. 52p. 14pl. 2 maps. Oct. 1897. 15*c*.

Eg8 (30) Orton, Edward. Petroleum and Natural Gas in New York. 136p. il. 3 maps. Nov. 1899. 15*c*.

Eg9 (35) Ries, Heinrich. Clays of New York; their Properties and Uses. 456p. 140pl. map. June 1900. $1, *cloth*.

Eg10 (44) —— Lime and Cement Industries of New York; Eckel, E. C. Chapters on the Cement Industry. 332p. 101pl. 2 maps. Dec. 1901. 85*c*, *cloth*.

Eg11 (61) Dickinson, H. T. Quarries of Bluestone and other Sandstones in New York. 108p. 18pl. 2 maps. Mar. 1903. 35*c*.

Eg12 (85) Rafter, G. W. Hydrology of New York State. 902p. il. 44pl. 5 maps. May 1905. $1.50, *cloth*.

Eg13 (93) Newland, D. H. Mining and Quarry Industry of New York. 78p. July 1905. *Out of print*.

Eg14 (100) McCourt, W. E. Fire Tests of Some New York Building Stones. 40p. 26pl. Feb. 1906. 15*c*.

Eg15 (102) Newland, D. H. Mining and Quarry Industry of New York. 2d Report. 162p. June 1906. 25*c*.

Eg16 (112) —— Mining and Quarry Industry 1906. 82p. July 1907. 15*c*.

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Newland, D. H. & Hartnagel, C. A. The Sandstones of New York. *In preparation*.

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—— Paropsonema cryptophya; a Peculiar Echinoderm from the Intumescens-zone (Portage Beds) of Western New York.
—— Dictyonine Hexactinellid Sponges from the Upper Devonic of New York.
—— The Water Biscuit of Squaw Island, Canandaigua Lake, N. Y.
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1 Beecher, C. E. & Clarke, J. M. Development of Some Silurian Brachiopoda. 96p. 8pl. Oct. 1889. $1.

2 Hall, James & Clarke, J. M. Paleozoic Reticulate Sponges. 350p. il. 70pl. 1898. $1, *cloth*.

3 Clarke, J. M. The Oriskany Fauna of Becraft Mountain, Columbia Co. N. Y. 128p. 9pl. Oct. 1900. 80*c*.

4 Peck, C. H. N. Y. Edible Fungi, 1895–99. 106p. 25pl. Nov. 1900. 75*c*.

This includes revised descriptions and illustrations of fungi reported in the 49th, 51st and 52d reports of the State Botanist.

5 Clarke, J. M. & Ruedemann, Rudolf. Guelph Formation and Fauna of New York State. 196p. 21pl. July 1903. $1.50, *cloth*.

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